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SCIENCE

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Science for Democracy

Ward Shepard

The Science Teacher and Legislative Proposals for the Promotion of Science

Frank E. E. Germann

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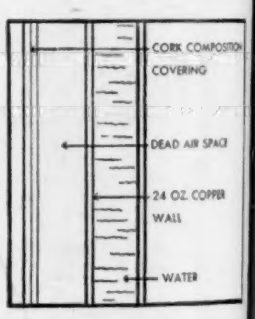

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SCIENCE

Vol. 103, No. 2664 Friday, January 18, 1946

Science for Democracy

Ward Shepard

Soil Conservationist, U. S. Department of Interior, Washington, D. C.[1]

SCIENTISTS—whether they like it or not—are forced by the circumstances of this new age to reassess their role in civilization. They are the trustees of the magnificent instrument of scientific method and of the great public domain of organized knowledge. Our complex and disordered civilization can no longer function without incorporating scientific method into the whole body politic and cultivating the domain of organized knowledge for its greatest social yield. Science must become the right hand of statesmanship.

Science of and for democracy must lift its imagination above the test tube and the laboratory to the whole realm of human life. It must envisage its task, not in cold abstract terms of "pure" science, but in terms of humanity itself. The job of science is to put its shoulder to the wheel and help rid civilization of poverty, squalor, disease, ignorance, subjugation, and violence. Its job, in short, is to help build a science of civilization.

Science cannot do this job unless, first of all, it has generous and assured public financial support, especially for basic research, which, though often far removed from immediate "practicality," is nevertheless the foundation and touchstone of all scientific progress. Science cannot do this job unless its freedom of inquiry is rigorously safeguarded. And, above all, science cannot do this job if it remains on the periphery of our civilization instead of being at the center. Neither science nor government can flourish as long as science is penuriously treated as a scarcity product rather than as a basic necessity of democratic civilization.

These are the underlying concepts motivating the proponents of a far-reaching, government-sponsored, all-science program, in which organized society, through government, would join hands with organized science in making the most of science for human life.

Yet the ideal of a broadly conceived national science program is threatened by a division of opinion among scientists. The newly formed Committee for a National Science Foundation, sponsored by Drs. Harlow Shapley and Harold C. Urey, warns that this division threatens the possibility of Congressional legislation and calls on scientists for a united front. Their appeal is based, not on the self-interest of science and scientists, but on the urgent needs of civilization itself for democratic well-being, security, and world order.

This emergency has arisen because a minority group of scientists, spearheaded by the Committee to Support the Bush Plan, is still actively pushing the fragmentary and ill-organized program embodied in *Science, the endless frontier,* despite the fact that the exhaustive Senate hearings sharply challenged its pretensions of being a comprehensive, democratic, all-science program. The broad trend of the hearings was for a far more effective alliance between government and science than the Bush program would permit. And this trend represented a real cross-section of competent American opinion—of natural and social scientists, of private and government scientists, of educators, of leaders of labor, agriculture, and industry, and of leading government officials. These hearings produced great clarification of thought on the difficult problem of organizing science as the "brain trust" of civilization, so that it is now possible, by continuing the democratic process initiated by these hearings, to create legislation that will meet the united needs of science, of government, and of the people.

Science, the endless frontier, as an obstacle to the attainment of this end, deserves a more critical scrutiny than it has yet received. Philip Murray, in his statement to the Senate Committee, made an incisive appraisal of its general spirit. Referring to the testimony of its sponsors and of certain sponsors of atomic legislation, he said:

> None of this testimony expresses faith in the democratic process. . . . None of it spells out partnership between scientists and the people of America. It is full of private fears, and an expression of tender anxiety about the profit system and its incentives, and the easily hurt feelings of professional scientists.

Science, the endless frontier, signally fails to rise to its great opportunity. It lacks any wide and bold

[1] The views expressed in this article are personal and unofficial.

vision of the role of science in modern civilization. It abdicates the social responsibility of science. So far from bringing science "to the center of the stage," as it proclaims, it would isolate it from the main current of human affairs. Despite its declaration of the "unity of science," it would dismember science by casting the social sciences into the outer darkness. Its "tender anxiety about the profit system" is indicated by its evasion of the immensely important patent issue and its complete faith in modern industrialism as the chief mode of applying science to human welfare.

The basic trouble with the Bush program is that, beneath the surface, its preoccupation is political rather than scientific. It sets up an intricate defense in depth against the well-worn bogeyman of "government intervention." There is no doubt that the creators of the Bush program profoundly believe that the least government is the best government.

Pertinent to this ideological stand is the fact that the Bush Committees had a considerable representation of large corporations, including Standard Oil and Du Pont, and of large private foundations. Most of its scientific membership was drawn from the Northeast, especially from the endowed universities. The smaller institutions and the underdeveloped regions were scantily represented. Equally striking was the fact that there were only two representatives of the immense array of government research agencies, and none whatever of the growing body of expert public administrators devoted to making democratic government socially efficient. There were no representatives of organized labor or of agriculture, both of which have an immense stake in the social application of technology. The insulation of the committees against social ideas is further indicated by the fact that there was no psychiatrist on the medical committee.

In essence, this natural science program is a system of government grants-in-aid to be administered by a virtually autonomous board of dollar-a-year men. The board's great disbursing powers are to be matched by equally great appointive powers: it would have unrestricted powers to appoint all its principal administrative and advisory officials, as well as all the state, regional, and national advisory boards required to assist it. A second dismemberment of science is proposed: the large number of government research activities are left entirely outside the scope of the Foundation. A separate Science Advisory Board, also composed of dollar-a-year scientists, is to be created to coordinate the activities of these agencies. Contrariwise, almost nothing is said about the outstanding need of coordination in nongovernmental science.

In its zeal to prevent government "regimentation," the Bush group has produced a plan that would prove unsatisfactory to the Government and to scientists. The dollar-a-year device has not won the confidence either of Congress or of the public. If the Government is going to give substantial support to research it will want to safeguard the public interest by putting administration in the hands of accountable public servants, with undivided loyalty. Moreover, the Government will want to say something about the over-all social efficiency of a national science program based on public funds. On the other hand, the scientists who have been allured by the doctrinal theory of "freedom" set forth in the Bush program should note well that what actually emerges is a powerful scientific oligarchy, with a combination of appointive and disbursing powers that could, in practice, control science and scientists without any effective check either from government or the great body of scientific workers.

The undemocratic ideology of the Bush program is high-lighted by the arbitrary exclusion of the social sciences. *Science, the endless frontier* makes it appear that President Roosevelt's letter requesting the formulation of a national science program excluded the social sciences. That interpretation is highly dubious. But even if it were not, a representative committee with a real vision of the social responsibility of science would have warned the President that science could not be meaningfully organized by sinking without a trace all the sciences, from psychology and economics to law and administration, that pertain directly to organized human society.

In the recent letter addressed by the Committee Supporting the Bush Plan, of which Dr. Isaiah Bowman is chairman, to President Truman, an entirely different excuse for the exclusion is given:

> The Bush report was based upon factual studies showing the need and outlining a program for Federal support in the basic sciences. There are no comparable data and program for the social sciences.

Unwary readers not acquainted with the Bush report—including even scientists and other people with disciplined minds—have no way of knowing that this statement is a piece of artful legerdemain. The joke is that the Bush program from its inception deliberately excluded the social sciences. Thus, what sounds like innocent wonderment at the absence of a social science program merely conceals the fact that it was planned that way.

According to the naive social theories implicit in *Science, the endless frontier,* the natural sciences are supposedly innocuous and neutral, whereas the social sciences are "dangerous" because they explore social traditions and institutions. Both of these implications are false. The atom bomb once and for all explodes the "neutrality" of technology. And

shelve the social sciences is sheer obscurantism. The modern world is inexorably confronted with change—swift, disruptive, and menacing. The ultimate question concerning the use of the social sciences is this: Shall we apply organized intelligence, in so far as possible, to understanding and directing change, or shall we leave change to the struggle of passion and factionalism?

The relatively youthful social sciences are, it is true, immature compared with the natural sciences. But their realism and usefulness have greatly increased in recent years as government has come to grips with depression, war, and reconstruction. If we are to have a national science program, we need a balanced all-science program, with the primacy lodged where it belongs, in the social sciences. If science is to make real sense in relation to human life, the natural and the social sciences must reinforce each other in a genuine partnership, for the natural sciences can function fully only as society is effectively organized. And both would be the gainers, in this partnership, for the natural sciences need to be humanized, the social sciences to improve their technical rigor.

The full use of all science, including social science, is indispensable for intelligent progress in all the great tangle of human problems that so compellingly confront modern government—for example, to cite only a few of them, full production and employment, social security, labor relations, race relations, public administration, public employment and relief, industrial monopolies, universal medical facilities, agricultural policy, the conservation of natural resources, regional development, the cause and cure of war, and the international allocation of raw materials and credit. At the best, without the full use of science, the vital decisions of government will have to be based largely on the inspired hunches of statesmen and administrators; and at the worst, on the quackery and factionalism of demagogues, supported by pressure groups.

In any national science program worthy of the name, the social sciences must be planted at the core of scientific effort, and especially at the core of government, which is their laboratory and testing ground. They must be planted there at the start, not at some hypothetical future time, as the Committee to Support the Bush Plan proposes. For, once the social sciences were put away in moth balls, they would be condemned to languish indefinitely in favor of an unlimited, planless, and socially irresponsible development of technology.

The recent statement by the Committee for a National Science Foundation, signed by more than two hundred scientists, mostly in the natural science field, disposes of the two main fears of the Bush program—the fear of government and the fear of social inquiry:

> The freedom of inquiry upon which science is dependent can be guaranteed for research under government no less than under private auspices.
>
> The government should support research in all fields of fundamental scientific inquiry relevant to national interest without arbitrary exclusion of any area.

Science can be democratically organized for far greater effectiveness and far greater real freedom than it can possibly achieve under an isolationist, laissez-faire regime. Nobody who believes in democracy wants government regimentation of science. But freedom itself must be consciously "organized," as the world is learning at the cost of two world wars and world depression.

There is a wide gap between disorganization and regimentation which it is the function of a dynamic democracy to fill with new forms of democratic, pluralistic, and efficient organization. The dramatic research that produced the atom bomb shows that skillful group-work can speed up scientific production enormously. Imagine, for example, a similar skill and energy—minus the war tension and the regimentation—applied to cancer, race prejudice, full production, or world peace. Science can be organized for full social efficiency without regimentation by providing scientists themselves with the cooperative tools of effective social workmanship.

Government can "intervene" to bring coherent purpose and united energy to bear on human affairs without assuming the role of managerial bureaucracy. It can do so by defining and delegating responsibility to given functional groups. Government can assist scientists in organizing science for full social efficiency without regimenting it. It can do so by putting the main (though not the exclusive) responsibility on the scientists themselves by giving them effective tools for cooperative action. To protect their freedom, the scientists themselves must be democratically represented in the National Science Foundation; and they must, moreover, work out democratic group methods for effectively organizing a much greater and more coherent scientific effort than anything hitherto visualized.

The National Science Foundation visualized by the Shapley–Urey Committee will require the active, democratic cooperation of state, regional, and national scientific bodies in formulating scientific programs and allocating scientific funds. Scientists themselves—and not government alone—must face the need of science, not merely for adequate financial resources, but for priorities and complete and adequate coverage of the whole scientific field, for cooperative research, for co-

ordination of effort, and for wholehearted democratic application of the results of research. Democratic process demands that all scientists have a responsible voice and part in this movement.

Public welfare demands also that government have a voice and part in this movement. We need a body of responsible public servants with adequate means, both financial and cooperative, to assist the organized scientists in making the most of our national scientific effort. Its role of promoting coordination would apply both to governmental and nongovernmental research agencies, but it would be facilitative rather than managerial.

In such a formula, we have a two-way, cooperative-bargaining arrangement between government and science. It would avoid the evil of the Government trying to dominate science and the equal evil of frittering away our scientific talent through fragmentation and financial inanition. It would preserve scientific freedom, but it would bring a vastly increased energy, order, and responsibility into our total scientific effort. If democracy is to function, it must be efficient; and it can be efficient without regimentation. Disorder is collective frustration. Orderly cooperation augments the power and freedom of the individual. The essence of freedom is that it can survive only if it is based on order.

Science can become the most important tool for democratic reorganization, but not if it remains half-heartedly used and socially irresponsible, and not if leading scientists sow distrust of government and remain squeamishly aloof from it. The Bush group, in effect, not only deny that government has the responsibility to assist in organizing science for human welfare, but they deny even that the scientists have that responsibility. For they would leave the laissez-faire tradition of science essentially intact and would perpetuate the isolation of science from the swirling current of human life. Above all, by debarring the full implementation of scientific method in democratic government, they would actually hasten what they most fear, namely, ill-considered, makeshift extension of government power.

In the age of the atom bomb, horse-and-buggy government is not merely an anachronism: it is a crime. To deprive government of the powerful tool of scientific method in reorganizing human relations, through law, administration, and cooperative social organization, would indeed condemn human society to remain in an "endless frontier" of force and chaos.

The Science Teacher and Legislative Proposals for the Promotion of Science

Frank E. E. Germann

University of Colorado and Executive Secretary, Southwestern Division, AAAS

THE NOTABLE SUCCESS of the Office of Scientific Research and Development in coordinating and originating scientific studies during our recent crisis has made our entire population conscious of the value of research. The report of the Director, Dr. Vannevar Bush, to President Truman, entitled *Science, the endless frontier,* has served as a framework of a bill (S. 1285) introduced by Senator Magnuson at the first session of the 79th Congress. The purpose of this bill and those of Senators Kilgore, Johnson (Colorado), and Pepper (S. 1298), Senator Fulbright (S. 1248),[1] Senator Byrd (S. 825), and Representative May (H. R. 3440) is to attempt to carry over to peacetime the advantages of a national research program. The National Research Council, organized during World War I, has announced the extension of its activities to the granting of Predoctoral Fellowships in the Natural Sciences while continuing its program of Postdoctoral Fellowships. The Research Corporation of New York will devote $2,500,000 during the next five years to support of research in chemistry, physics, mathematics and their applications, such as engineering. These grants are to be made to institutions and are to be used to support the research work of persons of proven research ability who are desirous of entering or re-entering, the faculties of institutions of learning. "Professional salary of the applicant must be borne by the institution as well as responsibility for continuation of the professional opportunity of the applicant beyond the terms of the grant."

Whereas all of the above programs should prove of great value to the stimulation of research, they fail to bring aid to the men under whom research is to be conducted. *No stream can rise higher than its source.* For many years the most competent research

[1] Since this was written these latter bills have been combined into one S. 1720 (see *Science,* 1946, **103**, 10; 39–44), but the cogency of Dr. Germann's comments is in no way weakened by this event. Ed.

workers and teachers have been enticed away from educational institutions by our large industrial corporations, which have been able to pay salaries commensurate with the abilities of the men. A small number of our highly-endowed educational institutions have been able to hold and attract outstanding scholars because of their higher salary scales, but the average private or state-supported institution has been forced into mediocrity. The success which these have achieved is the result of a number of factors reflecting no credit on the institutions. Among these factors the following may be mentioned:

(1) Because of his own health or that of a member of his family, a teacher may be forced to remain in a given climatic environment, regardless of salary.

(2) Because of a personal fortune, the teacher is free to work where he chooses.

(3) In order to live on the limited salary offered by the institution of his choice, the teacher may refrain from marrying and thus avoid financial obligations.

(4) A married teacher may refrain from, or postpone, having a family because of the low salary received.

(5) The teacher may also follow the European plan of marrying wealth.

(6) The family may scale its standard of living far below that which would seem to be appropriate to the profession.

(7) The wife may also have to be a breadwinner.

No one will deny that the conditions cited above do exist, and that they drag down the very group of society which in the final analysis has produced the vast body of educated and highly skilled scientists used as raw material by the OSRD in the task of winning the scientific aspects of World War II. Universities have the definite obligation of training men to enter the research laboratories of industrial organizations, but they also have an obligation to train men for the teaching profession. If this latter responsibility is not met by making university teaching financially more attractive, the quality of the product will of necessity deteriorate. In the long run, industrial laboratories are bound to suffer. The situation has been serious for many years, but the recent high level of wages paid to boys and girls graduating from high schools has served to bring the matter to a head. When many college and university positions pay only $1,500 to $2,000 to persons with doctorate degrees, is there any wonder that competent persons cannot be found to fill them? Even now, when the war is over, we are still able to place women just receiving the baccalaureate degree in chemistry, in industrial positions at $200 per month!

What future can we promise young men and women holding pre- and postdoctoral fellowships at $1,800 to $3,000 when we still offer $2,000 for assistant professors and require that they have the doctorate degree? What chance do we have to secure competent teachers in science when a full professor, after thirty years of service, may never reach a salary of $4,000? Intelligent young men should hesitate to make the sacrifice, knowing they will be better able to provide for their families if they choose the industrial offers which in a few years may bring them salaries of $10,000 or more. Recently a request was received from a university asking us to recommend someone holding both the M.D. and the Ph.D. degrees. The salary was $2,000, and the apology was added that this offer was being made in the hope that someone not actuated by financial needs might be willing to accept. What a travesty on justice! How long shall such conditions prevail? Shall universities continue to base salaries on individual needs or the minimum for which men will work, rather than on what they are worth in a competitive labor market? Should not a teacher be judged to be worth as much as his students. If not, why keep the teacher?

It is probably too much to expect to ask American industry to do something in the way of subsidizing professional salaries in our educational institutions so as to make these positions at least as lucrative as equally skilled industrial workers. However, the writer is convinced that such a move would, in the long run, reap handsome dividends for the donors. Such an undertaking, sponsored by the Federal Government, and possibly financed from excess profits taxes, would not seem to be unreasonable, because it would be returning only a small percentage to the teachers who had made corporation profits possible.

Some plan to accomplish the above end should be incorporated in one of the bills now before Congress or in some compromise bill resulting from the recent hearings. No plan yet proposed can hope to raise the level of scholarly achievement as much as can be accomplished by placing college and university teaching on a plane where the teachers will no longer have to apologize for their inability to go to scientific meetings, to take vacations, to care for the health of the family, and to do all those things which are expected of them by society.

Scanning Science—

Dr. David Starr Jordan was elected President of the California Academy of Sciences at its recent annual meeting.

—24 January 1896

Science Legislation

Scientific Training

Howard A. Meyerhoff

Executive Secretary, AAAS, Washington, D. C.

In his recent radio address to the nation, President Truman gave more attention to the things Congress is not doing than to the things which are getting done. Scientists may take their cue from the President and give thought to one vital question to which altogether too little consideration has been given, namely, the replacement of scientific and engineering personnel lost during the war years.

The question is critical. Many scientists were drafted—commonly late in the war period after the use for their skills was no longer urgent and deferments were cancelled. Numerically, the most serious losses were caused by the drafting of 18-year-olds who would have entered the colleges and technological schools. Some of these men may undertake belated training when they are discharged from military service, but many will not. Meanwhile postwar projects lag for lack of men to handle the technological problems involved. Meanwhile, too, the nation is fast losing to other far-sighted countries the technological pre-eminence which was a major factor in victory.

Congress cannot be criticized for not attending to this problem, much less solving it, for scientists themselves have done little about it. The American Chemical Society tried, with only a little help from other organizations, to obtain deferment for new recruits in essential scientific fields. One bill was introduced into Congress (H.R. 2827) to achieve this purpose, but it died in committee. Our scientific personnel, both actual and potential, was expendable, but unlike expendable military personnel, no one assumed any responsibility for replacing it.

Now, five months after hostilities have ceased, the situation is unchanged. Selective Service, though it may defer students who are partially trained in scientific and technological fields, encounter few 18-year-olds in that category. Universal military service, as proposed, will continue the same indiscriminating policy, if adopted. The shortage of scientists and engineers, though it may be partially offset by returning veterans, will be increased rather than corrected.

During the past few weeks representatives of the engineering societies, the physicists, chemists, and the Association have met to consider corrective measures. The drain of trained or partly trained men has been checked but not stopped. It is now imperative to correct the deficit through immediate changes in Selective Service and through specific provisions in the Universal Military Service bill, if the latter is adopted. It may be just as vital to insure replacements of scientific and technological students if Universal Military Service is not adopted.

As a basis of immediate action twelve organizations phrased a resolution which contains a program adaptable to Selective Service and to Universal Military Service if passed. With some modification it can be effectively utilized if Universal Military Service is rejected. Indeed, the unique importance of science and technology in war and peace has prompted the suggestion by one Senator with whom the program has been discussed that the resolution may be the only program which can effectively prepare us at once for the grim requirements of war and the expanding needs of peace.

Twelve organizations have endorsed the resolution:

The American Association for the Advancement of Science
The American Ceramic Society
The American Chemical Society
The American Institute of Electrical Engineers
The American Institute of Mining and Metallurgical Engineers
The American Society of Civil Engineers
The American Society of Mechanical Engineers
The Electrochemical Society
The Engineers Council for Professional Development
The Engineers Joint Council
The Engineers Society of Western Pennsylvania
The Institute of Radio Engineers

They are sure others will recognize its importance and will want to take similar action. It is published herewith for the consideration of scientists and scientific societies that recognize the gravity of the current situation and foresee the still more serious problems of the future.

WHEREAS national security and public welfare are dependent upon and vitally affected by the quality of scientific, engineering and technological research, both fundamental and applied;

WHEREAS fundamental and applied research are entirely dependent upon ample reserves of trained and experienced manpower;

WHEREAS the ranks of scientists and engineers have been seriously depleted since 1941 by the requirements of military service;

WHEREAS the normal flow of students into the colleges and the engineering, technical, and graduate schools has almost completely ceased during the period from 1941 to 1945;

WHEREAS the alarming deficit in highly trained technical personnel will be further increased if Selective Service is continued without full recognition of the fact that technical personnel is as vital to national security and welfare as military personnel;

THEREFORE BE IT RESOLVED that the imperative and immediate need of replenishing scientific and engineering manpower be called to the attention of the President and the Congress;

BE IT FURTHER RESOLVED that the Congress be asked to take prompt legislative steps to insure a flow of scientific and engineering personnel through the colleges and the engineering, technical, and graduate schools adequate to national security and the public welfare;

BE IT FURTHER RESOLVED that such legislation as may be required be based upon principles consonant with the democratic methods embodied in Selective Service and with the tested methods of the institutions of higher learning; that to this end the following provisions be incorporated in such legislation:

1. Young men who have attained their eighteenth (18th) but not their twenty-sixth (26th) birthday shall be allocated to the colleges, universities, and technical schools after induction rather than through deferment;

2. Such men should be chosen by recognized and established selective processes, as far in advance of induction as possible;

3. The selection of these men should be administered by the appropriate government agency, which shall determine from year to year the number of young men who may be admitted to the training program, so as to bring the total anticipated output of trained personnel at least to prewar standards;

4. The young men so selected shall be assigned to accredited colleges and institutions of their own choice;

5. Such colleges and institutions shall not be obligated to impose on these students any requirements other than those normally imposed upon civilian students; but no provision contained in this plan shall exclude said students from enrolling voluntarily in reserve officer training programs maintained by the Army and Navy in the institutions in which they enroll;

6. The duration of the training period shall be identical with that designated in the Selective Service training program; the academic calendar for training shall not exceed nine months in any one year, the remaining three months being available to the Army or Navy for military training;

7. Financial support for trainees during this period shall not exceed that awarded to trainees under the Servicemen's Readjustment Act (Public Law 346);

8. Failure on the part of any trainee to meet the scholastic requirements of the institution to which he is assigned shall result in immediate transfer to regular military duty;

9. Trainees admitted to this program shall be subject to the same obligations for subsequent public service as may later be incorporated in a plan of national scholarships and as applied to a training period of equal length;

BE IT FURTHER RESOLVED that the acute shortage of scientific and engineering personnel in the colleges, in government agencies and in industry be immediately alleviated by adoption of those provisions of the Vannevar Bush report (*Science, the endless frontier*) relating to the release of scientists and engineers now in the armed forces; and

BE IT FINALLY RESOLVED that full cooperation of the legislative and executive branches of the Federal Government be solicited, not only in the implementation of this emergency program which is designed to correct the deficit (now estimated at approximately 150,000) of scientific and technical students, but also in assuring a future supply of trained manpower, adequate in numbers and in skill to meet the involved problems of national progress, welfare, and security.

Technical Papers

The Anemia Associated With Chronic Infection[1]

G. E. Cartwright, M. A. Lauritsen, S. Humphreys, P. J. Jones, I. M. Merrill, and M. M. Wintrobe

School of Medicine, University of Utah

A study of the anemia accompanying such chronic conditions as empyema, osteomyelitis, endocarditis, and various other chronic infections in humans has revealed a rather characteristic chemical pattern. There is a pronounced hypoferremia which is accompanied by hypercupremia, an increase in the erythrocyte protoporphyrin and coproporphyrinuria. These results are briefly summarized in Table 1. Only male

TABLE 1

Summary of the Chemical Characteristics of the Anemia Associated With Chronic Infection

	Plasma Iron γ %	Serum Copper γ %	Erythrocyte protoporphyrin γ/100 cc. RBC	Urinary coproporphyrin γ/24 hr.
Normal				
No. of cases .	20	25	10	22
Average value	120	116	30	106
Chronic infections				
No. of cases .	19	11	19	14
Average value	29	220	175	278

patients were used in the study. Morphologically the anemia was found to be normocytic, or slightly microcytic and slightly hypochromic.

The administration of iron by mouth to these patients was associated with no significant increase in the content of iron in the plasma, in sharp contrast to the finding in normal persons. Intravenous administration of iron was associated with a rise in the plasma iron level of somewhat smaller degree than occurs normally and a return to preinjection levels which took place much more rapidly than is normal. In these respects the anemia associated with chronic infections is similar to the anemia of iron deficiency. Hypoferremia, hypercupremia, and an increase in erythrocyte protoporphyrin are also common to both conditions. Unlike iron deficiency anemia, however, the anemia of infection does not respond to either oral or intravenous iron therapy. We have been unable to obtain evidence that the anemia associated with infection is hemolytic in nature or that there is a d tive synthesis of either globin or protoporphyri

This evidence may be interpreted as indicating there is a failure to form heme because of la sufficient iron to incorporate into the protoporp molecule. As a result, protoporphyrin and copp not utilized, and their quantity increases, awaiti time when iron will be made available so that th mation of heme may proceed at its normal rate.

To investigate more completely the pathogenes this anemia, intramuscular staphylococcal abs were produced in 3 adult dogs. The plasma iron dropped precipitously from levels of 150 to 275 m grams per cent to levels of 15 to 30 micrograms cent in 48 hours. This was followed in approxim 15 days by the development of moderate anemia. this time the plasma iron level had returned to mal. This stage was followed shortly by clinical provement and disappearance of the anemia. intramuscular injection of staphylococcal toxi typhoid vaccine produced less definite changes. intramuscular injection of sterile turpentine in dogs produced a sharp fall in plasma iron with hours in all of the animals. A second injectio turpentine was followed by the development of a erate degree of anemia. This indicates that n bacteria nor their toxins are essential for the pr tion of hypoferremia and suggests that an infla tory reaction *per se* is capable of producing change. We are unable to state with cert whether a specific substance is elaborated by a flammatory reaction. The intravenous injection each of 7 dogs of 50 ml. of sterile pleural fluid tained following the intrapleural injection of tu tine, resulted in a suggestive, but not a prof lowering of the plasma iron.

Menkin (*1, 2*) has shown that there is an ac lation and fixation of iron in inflammatory t Schäfer (*3, 4, 5*) has demonstrated that there increased iron retention in febrile conditions in dren and that during mild infections in mice iro cumulates in the reticulo-endothelial system. O basis of these observations, together with the we have presented in humans and in dogs, it seems possible to outline a working hypothesis the pathogenesis of this anemia.

According to this hypothesis, as a result o inflammatory reaction, iron is diverted to the t and is not made available for hemoglobin synt As a consequence of this increased demand o tissues for iron, the removal of this element fro

[1] The work described in this paper was carried out under a contract recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the University of Utah.

lood stream is hastened and possibly its absorption rom the bowel is even increased. Because iron is ot made available for use by the bone marrow, the action

$$\text{Protoporphyrin} + \text{Iron} \xrightarrow{Cu^{++}} \text{Heme}$$

annot proceed and anemia develops.

The fault in iron metabolism cannot be corrected the administration of iron. This is probably beuse of the persistent and urgent demand for iron fulfill some function in relation to infection, which s a greater priority for iron than hemoglobin formaon.

These experiments are to be reported in detail in near future.

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n Observation on the Red Cell ontent of the Blood of the horoughbred Horse[1]

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While making observations of the blood of the rse, we noticed consistent differences between the oroughbred and the cold-blooded horse with regard the red cell count per cubic millimeter and the moglobin content in grams per 100 ml. of blood. e average values obtained in the thoroughbred ani- al have also a relation to age, as is shown in Table which includes standard errors and average values r the mean corpuscular hemoglobin.

TABLE 1

Group	Number in group	Red cells millions/mm.³	Hemoglobin grams/100 ml.	Mean corpuscular hemoglobin, γγ
oroughbreds				
Foals	8	12.91 ± 0.73	13.86 ± 0.31	10.7
Yearlings ..	12	12.50 ± 0.74	14.13 ± 0.46	11.3
2-3 years ..	12	10.80 ± 0.25	14.10 ± 0.46	13.1
Older horses.	8	11.55 ± 0.74	15.37 ± 0.78	13.3
ld-blooded horses	10	7.94 ± 0.28	12.63 ± 0.33	16.0

The differences between the means of the red cell unts of the two- to three-year-old horses and those the foals and of the yearlings are significant, as so is the larger difference between the means of the counts of the two- to three-year-olds and those of the counts of the cold-blooded horses.

Table 1 shows that the red cell count and hemoglobin content in the thoroughbred are higher than the count and hemoglobin content in the cold-blooded horse, the red cell count for which is usually given as between 6 and 8.5 million.[2] At the same time the quantity of hemoglobin per cell is smaller. Table 2, which gives the average hemoglobin content, mean cell volume, and mean corpuscular hemoglobin concentration in 5 thoroughbred and 5 cold-blooded horses, shows that the cells of the thoroughbred carry less hemoglobin per cell because the cells are a little smaller and because the hemoglobin concentration is a little less. The thoroughbred, nevertheless, carries more hemoglobin per milliliter of blood than does the cold-blooded horse because there are more red cells per unit volume.

TABLE 2

	Thoroughbred	Cold-blooded
Red cells, millions/mm.³	10.35	8.21
Hemoglobin, grams/100 ml.	13.89	12.06
Mean cell volume, μ³	42.2	43.6
Mean corpuscular hemoglobin concentration, per cent	32.7	33.5
Mean corpuscular hemoglobin, γγ	13.4	14.7

This combination of an increased red cell count, a decrease in red cell volume, a decrease in mean corpuscular hemoglobin concentration, but an increase in the hemoglobin content per milliliter of blood, is met with in animals (rabbits) subjected to low atmospheric pressures (*1*) and in other states in which the bone marrow is hyperactive, such as polycythemia vera in man. Since it is most improbable that thoroughbred horses suffer from an oxygen lack sufficient to keep their bone marrows in a state of hyperactivity, the higher red cell counts and hemoglobin contents in the blood of these animals is probably a genetic characteristic, as polycythemia sometimes is in man. The probability of the genetic explanation being right is increased by the fact that the high red cell counts are present at birth and are maintained in the weanling, yearling, and ensuing age periods. The elevated counts are therefore not the result of training or conditioning processes which prepare the animal for racing. It may very well be, of course, that the increased hemoglobin content and slightly smaller cell size confer an advantage on the thoroughbred when running at high speeds, and so these may be characteristics which have become accentuated in the process of the "improvement of the breed."

Reference

1. DUBIN, M. *Quart J. exp. Physiol.*, 1933, **23**, 31.

[1] This study was made on the horses of Col. C. V. Whitney, whom we are indebted for his courtesy. The expenses of e investigation were defrayed by the Grayson Foundation.

[2] Several references are given in Appendix A of Wintrobe's *Clinical hematology* (Philadelphia: Lea and Febiger, 1942).

Fur and Feathers: A Response to Falling Temperature?[1]

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At the present time it seems to be generally conceded that "the appearance of fur and feathers in birds and mammals came in response to a need for some mechanism for heat conservation," and that mutations in the direction of these dermal coverings survived owing to the advantages of heat or energy conservation conferred upon the possessor of these new insulating features. Aside from the fact that necessary mutations give no evidence that they ever develop in response to a need, this Lamarckistic conclusion seems dubious for the following reasons:

(1) All the available evidence strongly suggests that the mechanism of heat regulation, which is closely associated with the warm-blooded state and is essential for that condition, has appeared as a comparatively late evolutionary acquisition. In the field of phylogeny we observe the phenomenon of a succession of steadily ascending body temperatures, culminating in what are assumed to be approximately the most specialized, warm-blooded creatures. It is interesting, and possibly no coincidence, that the morphological structures on which we base phylogenetic position in birds and mammals should also accompany the physiological trait of successively higher temperatures. The record is not perfect, that is, there are occasional exceptions to the rule, but in general there is a thermal ascent accompanying the morphological specializations in these groups.

(2) In the field of embryology as in phylogeny we find evidence which similarly suggests that thermal regulation and the development of warm-bloodedness is an apparently recent acquisition in the development of organisms. Although the interpretation of this situation might be ascribed to several possibilities, it seems most reasonable to conclude that thermal regulation and warm-bloodedness must have arrived fairly late in the evolutionary process, probably long after fur and feathers made their appearance.

The third point militating against the acceptance of the current speculations concerning the origin of fur and feathers is fairly simple.

If warm-bloodedness is of fairly recent origin, then we must assume that the early, prototypal forms which gave rise to feathered and furred creatures were probably cold-blooded. If cold-blooded, they were definitely ectothermic in nature, that is, they derived their chief source of heat from outside of the body in direct contrast to the later warm-blooded or endothermic types in which temperatures are chiefly a result of metabolic activity, often made possible by a prodigious expenditure of energy.

In so far as we know, all ectothermic animals (with the exception of colonial types, such as the bees) for all practical purposes are wholly dependent upon outside sources for their body heat and all these types become lethargic, even comatose, in the presence of falling temperatures. The naked skin of reptiles expedites the absorption of solar energy, and to interpose a barrier such as fur and feathers between the heat source and the body would seem to be impractical from the survival standpoint, except under conditions of high or increasingly great incidence of solar radiation. Survival is difficult at best, and adjustment to the environment is usually rather precisely arranged —as witness the fate of most mutants. It is true that radiant heat will penetrate through fur and feathers and therefore that the possessor of these insulating coats could absorb some of the heat from outside the body in spite of this barrier, but on the other hand survival in a cold-bloded form could hardly be fostered by the development of any handicap to maximum efficiency in heat absorption, particularly if temperatures in the environment were dropping.

If fur and feathers developed under conditions that but for their presence, would have produced injury due to increases in the intensity of solar radiation, we would expect to find the interposition of an insulating covering a highly beneficial novelty having real survival value. By high temperature or rising temperature the reference point is, of course, that of the animal's limits of thermal tolerance and not temperatures as we may know them today.

The possession of a mechanism that would slightly retard accessions of heat would extend the total number of minutes or hours of diurnal activity, especially toward mid-morning, that might be available to a foraging animal. Such a coat would also enable the animal to extend its mid-day excursions into the sunshine for longer periods of time due to this protection against rapid overheating. Toward evening, after excursions into the open and subsequent return to shade or to burrows, the presence of this radiation excluding mechanism would have a reverse effect, that is, it would retard the loss of heat and would thus extend the animal's postwarming periods of activity.

For these reasons it seems more logical to conclude that mutations producing fur and feathers were originally retained because of their function as a device that could retard the absorption rate of excessive solar radiation. Later on, their possession permitted the gradual development of temperature control necessary for the development of warm-blooded animals.

Without an already acquired insulating coat, it

[1] Revision of a concept originally stated in: R. B. Cowles. *Amer. Nat.*, 1940, **74**, 559.

difficult to understand how energy-expending, internally heated systems could have survived in a cooling environment. This use for insulation must be a fairly recent innovation because even the more primitive, less specialized mammals still show a tendency toward ectothermism (poikilothermism) while many of the most highly specialized thermal animals, the birds, do not acquire complete endothermism (homeothermism) until some time after hatching.

This analysis presents another example in which it can be argued that rising or high temperatures may have played a dominant part in evolution.

In the Laboratory

Semi-continuous Tap-water Aerator[1]

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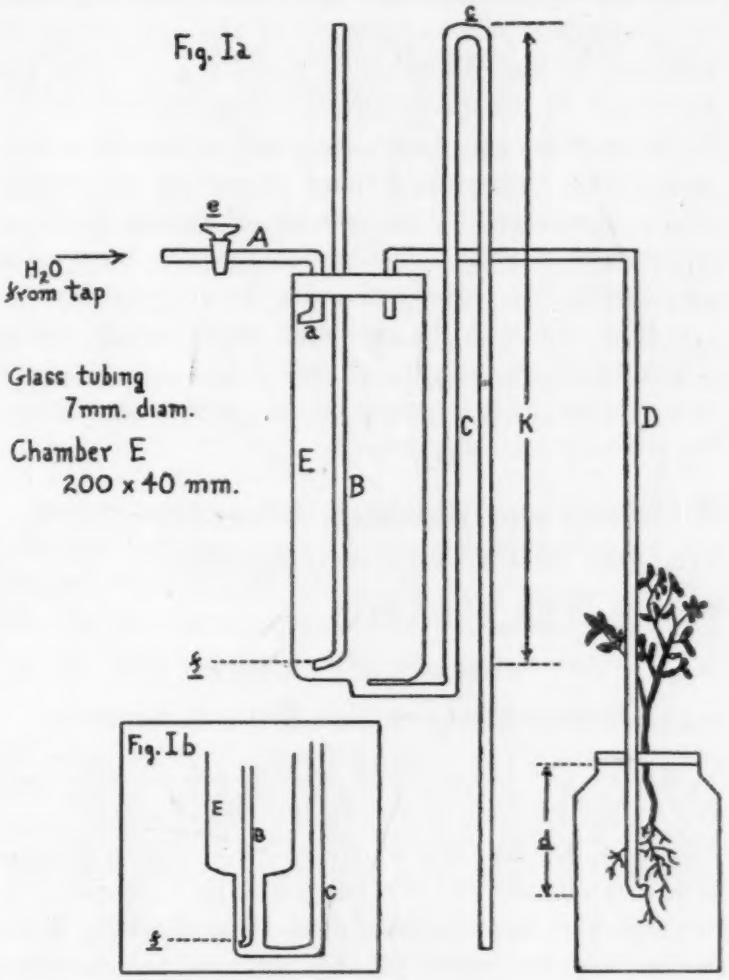
For many species, the water culture method for growing plants requires continuous aeration of the nutrient solution. By this means, the root system is maintained at an oxidative level favorable for active growth and metabolism.

In the greenhouse and in most laboratories, the source of oxygen is generally an air compressor, from which a continuous supply for the aeration process is readily obtainable. In the event that a compressor is not available, an alternative source of air is required.

The apparatus described herein has been constructed from common inexpensive glassware and requires a minimum of space. A trap or filter for oil spray and other contaminants commonly found mixed with air derived from a compressor is unnecessary because the source of such foreign material is eliminated. The quantity of water used per day for production of a moderate stream of air (approximately 10 cc. per minute) is usually in the neighborhood of four gallons or less. Results indicate that a relatively high efficiency and low cost of operation are characteristic of this equipment.

The apparatus is illustrated diagrammatically in Fig. 1a. Tap water is forced through A into chamber E, open to the atmosphere only through tubes B and C, and dropwise rate of water flow is regulated by stopcock *e*. Air is initially displaced from the chamber through B until water approaches level *f*. Subsequently, aeration of the solution commences after the pressure due to the head of water *d* has been overcome. When water has risen to level *c* in the siphon tube, it is automatically removed from chamber E by a siphon mechanism through C. During this short interval, aeration ceases. When the chamber has been emptied, the cycle is repeated and aeration continues. Water inlet tube A and tube B are bent toward the side of chamber at *a* and *f* in order to avoid spattering at the bottom of tube C during the siphoning interval and, consequently, to minimize introduction of excess air bubbles into tube C which affects the continuity of fluid in C. A highly porous, fritted glass disperson disc may be used for more effective gas distribution at the terminal end of the aeration tube, D. However, it has been determined that a low porosity tube introduces some difficulty. The magnitude of the frictional resistance to gas flow offered by such material results in an undesirable increase in the total pressure which must be exerted by the expanding gases in E to overcome the gross resistance in the system.



The time interval between intermittent aeration can

[1] The authors wish to express their appreciation to T. C. Broyer for helpful suggestions and criticisms with this paper, which was written while the senior author was located in Pasadena, California.

be minimized by designing the apparatus so that the time required for removal of water from E is small as compared to the time necessary for liquid in C to reach level *c*. Although the dimensions of chamber E (Fig. 1a) are satisfactory for aeration of plant root systems, the time interval between cessation of siphoning and production of a closed system in E upon reaching level *f* can be reduced if continuous aeration is desirable for some other purpose. This can be accomplished by constructing the chamber as shown in Fig. 1b. The advantage of a slight increase in efficiency is consequently attained at the expense of a more elaborate design, which decreases to some degree the simplicity of the original apparatus.

It has been found that, in order to maintain the described continuity in the rate of aeration with the apparatus in Fig. 1a, the relationship between height K of siphon tube C and head of water *d* to be overcome in the culture tank can be formulated by the following approximation: $K = 2.2d$. Obviously, this relationship is only applicable if the dimensions of chamber E and diameter of glass tubing used are equivalent to the specifications outlined in Fig. 1a.

The aeration equipment described in this paper was constructed with siphon tubes of several dimensions and used successfully for aeration of culture solutions of various depths. The apparatus has been used continually for periods of more than thirty days at one time, and with the exception of occasional minor adjustments of the rate of water flow due to slight fluctuations in the pressure of the main water supply, no difficulty was experienced.

Prozones and Blocking Effect in Normal Iso- and Hetero-Agglutination With Cord Sera

HERBERT H. LUBINSKI

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Wiener (*2*) has recently described a blocking test for Rh sensitization as a method to detect specific antibodies in anti Rh sera, which otherwise fail to demonstrate the usual *in vitro* agglutination phenomena. He has also demonstrated that these blocking antibodies are the cause of the prozone phenomenon, which may be observed, not infrequently, in anti Rh agglutination.

Using the blocking technique, Levine and Gilmore (*1*) were able to obtain a blocking effect with the serum derived from a patient suffering from infectious mononucleosis in which the Paul Bunnel reaction was negative. The effect was quite analogous to that observed in Rh negative mothers of erythroblastotic infants.

The opportunity presented itself to the writer to test the relation of blocking antibodies to the prozone phenomenon in normal iso- and hetero-agglutination. During a study on cord sera four sera were found among several hundred which showed a more or less marked inhibition zone. These sera, which had been stored at refrigerator temperature for 2 to 3 weeks, were used to search for the presence of blocking antibodies. The sera were all group O.

Technique: Previously unheated serum (0.2 cc.) was diluted in increasing amounts with 0.2 cc. of saline and 0.1 cc. of a 2.5 per cent suspension of thrice-washed red cells added. The mixture was shaken well and centrifugalized for 2 minutes at a speed of 1,200 rpm. A first reading was then made, to see if an inhibition zone was present. After renewed centrifugalization the supernatant fluid was withdrawn and replaced by a type-specific serum diluted to such a degree that it still gave a 4+ reaction with the red cells used in the experiment. The tubes were then thoroughly shaken, centrifugalized a third time and readings made. Two tests were done with A and B cells, respectively, and two with rabbit cells. The results are given in Table 1. They show

TABLE 1

SERUM—DILUTION

Serum	Red cells	undil.	1/2	1/4	1/8	1/16	1/32	Nature of test
1652	B	−	−	±	3+	2+	±	Direct titration
		1+	2+	4+	4+	4+	4+	Blocking
1818	A	1+	2+	4+	4+	2+	1+	Direct titration
		1+	3+	4+	4+	4+	4+	Blocking
1819	Rabbit	−	2+	4+	4+	3+	1+	Direct titration
		2+	4+	4+	4+	4+	4+	Blocking*
		±	2+	4+	4+	4+	4+	Blocking†
1863	Rabbit	1+	2+	4+	4+	3+	1+	Direct titration
		1+	2+	4+	4+	4+	4+	Blocking

* Testing serum diluted 1/2.
† " " " 1/32.

that in the prozone the added serum could not achieve a complete agglutination, whereas in the highest dilutions 2+ and 1+ reactions as well as the negative were changed to 4+, thus demonstrating a blocking effect of the tested cord sera.

The question as to the nature of the blocking antibodies is still open to speculation. Wiener regards them as "an antibody having the capacity of combining with the sensitive cells without producing a visible reaction. After proper absorption the serum may give a positive agglutination reaction." One may think of an agglutinoid, *i.e.* an agglutinin which has lost the agglutinating part and consists of the hapto-

phore group only, similar to the relation of toxin and toxoid. However, another explanation may be that the blocking antibodies are identical with the hemolysin, which combines with the same cell receptor as the agglutinin. This theory assumes, of course, that agglutinins and hemolysins are different antibodies. Whatever it may be, it must have a greater avidity for the red cells than the agglutinin.

However, in the cases described above another possible explanation has to be considered for the following reason. It was found that the prozone phenomenon, which was observed on unheated sera, disappeared and was replaced by a 4+ agglutination, when the sera were previously heated for 30 minutes at 56° C. Since the tests were made after the sera had been kept in the refrigerator for 2 to 3 weeks, complement can be excluded as the cause of the prozones. It may therefore be possible that a heat-labile substance is present in cord sera which is responsible for the prozone phenomenon and the blocking effect with this type of sera.

Therefore, it seems that the inhibition zone as well as the blocking effect can be caused by different agents.

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News and Notes

Dr. Mark W. Woods has rejoined the staff of the Department of Botany at the University of Maryland after three years in the Armed Forces. He began his duties as associate professor of plant pathology on 1 December 1945.

Dr. Hyman I. Goldstein, Camden, New Jersey, has been appointed professor of the history of medicine, Essex College of Medicine and Surgery, Newark, New Jersey, and will deliver weekly lectures.

Dr. Harold Blum, of the U. S. Public Health Laboratory, Bethesda, Maryland, conducted a special conference at the University of Texas Medical Branch, Galveston, on the "Influence of Sunlight on Carcinogenesis," on 8 January. Dr. Blum has recently been awarded a Guggenheim Fellowship for the study of thermodynamic factors in evolution.

Dr. Donald Duncan, professor of anatomy at Louisiana State University Medical School, New Orleans, has accepted an appointment as professor of anatomy and chairman of the Department of Anatomy at the University of Texas Medical School, Galveston, and will assume his new post on 1 February.

Dr. Henry R. Kreider has been appointed chief chemist of The Wm. S. Merrell Company, Cincinnati, Ohio.

Dr. Richard J. Lund, mineral economist, geologist, and one-time director of the Miscellaneous Minerals Division of the War Production Board, has joined the staff of Battelle Institute, Columbus, Ohio. Prior to his three-year association with WPB, Dr. Lund served as consultant on miscellaneous minerals to the old Office of Production Management and Defense Commission, and earlier was for three years (1937–1940) editor of the *Mining Congress Journal.*

Col. James A. Tobey was decorated on 4 December 1945 with the Ordre de la Santé Publique, grade of Officier, by the French Republic. The presentation was made in Stuttgart, Germany, by Inspecteur General Coulon. Col. Tobey returned on 24 December to his home in Rye, New York, after two years and eight months service overseas, the last seven months as Deputy Military Governor of Wurttemberg-Baden in Germany.

Dr. Robert Simha has become a member of the Division of Organic and Fibrous Materials of the National Bureau of Standards, with special responsibility for the coordination of fundamental research on the molecular properties of high polymers.

Dr. Hugh L. Dryden has been appointed assistant director of the National Bureau of Standards. His services in this capacity will supplement those of Mr. E. C. Crittenden, who has served as assistant director for many years and who will continue in that capacity.

Dr. Ferdinand G. Brickwedde has been designated chief of the Heat and Power Division of the National Bureau of Standards, succeeding Dr. H. C. Dickinson, who retired on 31 October. Dr. Brickwedde has been with the Bureau since 1925.

Frederick S. Bacon, chemical research consultant, announces the formation of a partnership with Philip D. Wilkinson under the name of Frederick S. Bacon Laboratories. The new firm will continue the chemical research and consultation business established in 1939

at the present location, 192 Pleasant Street, Watertown, Massachusetts.

Dr. Harry J. Klepser, formerly of the faculty of South Dakota State College, and more recently a member of the U. S. Geological Survey, has been appointed assistant professor in the Department of Geology and Geography at the University of Tennessee.

Luther S. West, Major, Sanitary Corps, AUS, has been released from active service with the armed forces and will resume his duties as Chief of the Division of Natural Sciences, at Northern Michigan College of Education, Marquette, Michigan. For the past two years Dr. West has served as Chief of Medical Entomology, in the Division of Parasitology at the Army Medical School, Washington, D. C.

Dr. Milton Harris, director of research, Milton Harris Associates, Washington, D. C., was awarded the Olney Medal at the annual banquet of the American Association of Textile Chemists and Colorists held Saturday, 5 January 1946 at the Hotel Pennsylvania, New York. The award, which is made by the AATCC for outstanding achievement in the field of textile chemistry, is named in honor of Dr. Louis A. Olney, president emeritus of the association. In accepting the medal, Dr. Harris said: "In a broad sense, the technical problems of the textile industry are basically the same as those in all industries; they involve the harnessing of a vast reservoir of scientific knowledge resulting from work in educational institutions, government laboratories, and industry. This knowledge does not stem solely from research in the field of textiles. It comes from work in the allied high-polymer field, whether it be on resins, rubbers, or plastics; it comes from work in chemistry, biology, medicine, or literally any field of science. . . . Contrary to popular opinion, the country is not going to be presented at this time with many revolutionary textile materials or fabrics. The war simply accelerated the lines of work indicated earlier, but it will take all of our postwar efforts to bring these developments to their successful conclusion."

Dr. Philip S. Winnek has resigned as director of research with the Pitman-Moore Company, Indianapolis, Indiana, to accept a position with the Research Department of the Commercial Solvents Corporation, Terre Haute, Indiana.

Dr. Ralph B. Bowersox, recently research associate at the Harvard Underwater Sound Laboratory, has been appointed associate professor in the Department of Physics and Astronomy at Michigan State College. In the same department, Dr. C. D. Hause has been named professor and Dr. J. W. McGrath, associate professor. Thomas H. Osgood is head of the department.

John C. Flanagan, Col., Air Corps, Army of the United States, was recently awarded the Legion of Merit for exceptionally meritorious conduct in the performance of outstanding service for the Army Air Forces. The presentation of the medal was made 8 January 1946 by Gen. H. H. Arnold. The citation read in part: "Col. Flanagan pioneered in the establishment and development of the Army Air Forces Aviation Psychology Program and by his ingenuity in directing psychological research, he contributed signally to the development of effective selection and classification procedures for Army Air Forces personnel, which has resulted in the improved utilization of manpower and the creation of a more effective striking force."

George M. L. Sommerman has been appointed associate professor of electrical engineering at Northwestern Technological Institute. From 1 June 1942 to 1 October 1945, he was on leave from the American Steel and Wire Company, serving as a senior engineer with Section T of the Office of Scientific Research and Development, and, later, with the U. S. Navy Bureau of Ordnance in Silver Spring, Maryland.

Stephen J. McDonough, Jr., Washington science editor of the Associated Press from 1933 to 1942, and more recently chief of the Planning Branch, Technical Information Division, Office of The Surgeon General of the Army, has joined the staff of *Modern Medicine,* Minneapolis.

Subrahmanyan Chandrasekhar, professor of theoretical astrophysics at the University of Chicago, has been awarded the Sir Cattanmanchi Ramalinga Reddy National Prize for Mathematics by the Andhra University of India. The award, given annually for eminence in science, humanities, or fine arts, was presented to Prof. Chandrasekhar in recognition of outstanding merit in mathematics, pure and applied. He is the second to receive the prize, originated last year by Sir C. R. Reddy, chancellor of Andhra University.

Sir Henry Dale, O.M., F.R.S., will retire from his position as Fullerian professor of chemistry in the Royal Institution and director of the Davy Faraday Research Laboratory on 30 September 1946, according to *The Times,* London. His successor in both posts will be Prof. Eric K. Rideal, F.R.S., professor of colloid science in the University of Cambridge.

Dean Joseph W. Barker, of the Columbia University School of Engineering, has been presented the Distinguished Civilian Service Award for his work as special assistant to the Secretary of the Navy in re-

organization of the Navy's educational and training programs.

Announcements

The Lilly Research Laboratories, Indianapolis, Indiana, have made a grant of $2,500 to the University of Texas Medical Branch, Galveston, to establish a training fellowship in tissue culture, with special reference to the reticulo-endothelium system, under the direction of Charles M. Pomerat, professor of anatomy and director of the Tissue Culture Laboratory.

The Committee on Research in Endocrinology, National Research Council, announces that requests for grants-in-aid during the fiscal period from 1 July 1946 to 30 June 1947 will be received until 28 February 1946. Application blanks may be obtained by addressing the Secretary, Division of Medical Sciences, National Research Council, 2101 Constitution Avenue, Washington 25, D. C. In addition to a statement of the problem and research plan or program, the Committee desires information regarding the proposed method of attack, the institutional support of the investigation, and the uses to be made of the sum requested. No part of any grant may be used by the recipient institution for administrative expenses.

The Committee makes grants in aid of research in the general field of experimental and clinical endocrinology. However, applications for support of research in the problems of sex in the narrower sense cannot be given favorable consideration, and investigators seeking support in this field should direct their proposals to the Committee for Research in Problems of Sex, of the National Research Council. The Committee on Research in Endocrinology will continue to give consideration to the support of studies of the effect of sex hormones on nonsexual functions, e.g. on general metabolism and on the metabolism of steroid hormones.

The National Foundation for Infantile Paralysis, Inc., has made a grant of $3,500 to the University of Texas Medical Branch to support the studies of Dr. A. Packchanian on virus transmission in small animals, in order to try to devise a rapid diagnosis procedure, and to assist in screening tests in therapy. Dr. Packchanian is director of the Laboratory of Microbiology at the Medical Branch.

To explore new scientific methods for measuring opinions and attitudes the National Research Council and the Social Science Research Council have jointly formed a committee of eighteen leading experts drawn from business, government, and universities. Creation of the Committee on the Measurement of Opinion, Attitudes, and Consumer Wants was announced by Dr. Ross Harrison and Dr. Donald Young, executive directors of the two councils, which represent the numerous associations of professional workers in mathematics, statistics, psychology, and the various social sciences.

Samuel A. Stouffer, professor of sociology at the University of Chicago, is chairman of the new committee with Samuel S. Wilks, professor of mathematics at Princeton University, as vice-chairman. Its conduct will be under the immediate direction of an executive committee including Drs. Stouffer and Wilks, Dr. Frank Stanton, of the Columbia Broadcasting System, and Dr. Rensis Likert, of the U. S. Department of Agriculture.

The other members of the committee are:

P. G. Agnew, The American Standards Association
Edward Battey, Compton Advertising, Inc.
Hadley Cantril, Princeton University
Archibald M. Crossley, Crossley, Inc.
W. Edwards Deming, The Bureau of the Budget
Robert F. Elder, Lever Brothers Company
George H. Gallup, The American Institute of Public Opinion
Philip M. Hauser, The Department of Commerce
Carl I. Hovland, Yale University
Paul F. Lazarsfeld, Columbia University
Darrell B. Lucas, New York University
Elmo Roper, New York City
Walter A. Shewhart, The Bell Telephone Laboratories
C. L. Warwick, The American Society for Testing Materials

At the initial meeting plans were discussed for a long-term program aimed at promoting the exchange of information and experience among workers in business, government, and the universities who are facing similar problems in developing increasingly efficient methods of measurement. The committee authorized its executive body to plan the establishment of subcommittees which will review progress to date in various related areas of research, conduct tests, and lay out the next steps in research which may be undertaken either under the committee's auspices or by independent workers. Investigations are to be carried on under the immediate supervision of the several subcommittees, by staff workers supported by the two sponsoring Councils. The general committee will review the results of their work from time to time and serve as a clearing house for current problems.

Millions of dollars are now being spent annually in commercial and government surveys employing sampling procedures. The last two decades have seen the development in this field of a large and intricate body of methods based on mathematics, psychology, and other sciences. A concerted attack on problems

of sampling, questionnaire construction, and statistical analysis is expected to develop new and more economical ways of insuring the validity of findings, and to open up new fields in which these research tools can be usefully applied.

The Yerkes and McDonald Observatories of the University of Chicago announce the appointment of a new assistant director, Dr. W. A. Hiltner, who will also continue to serve as assistant professor of astrophysics. Dr. Gerard P. Kuiper, professor of astronomy, has returned to the Yerkes Observatory after an absence of more than two years, during which time he was connected with the Radio Research Laboratory of Harvard University. Dr. S. Chandrasekhar, professor of theoretical astrophysics, has returned to full-time work in astronomy at the Yerkes Observatory, after having served as part-time consultant at Aberdeen Proving Ground. Dr. Chandrasekhar was recently awarded the C.R.R. National Prize for mathematics by the Andhra University of India. Dr. D. M. Popper, instructor in astrophysics, has also returned after two years of war research at the Radiation Laboratory of the University of California. New appointments at the Yerkes Observatory include Dr. Wasley S. Krogdahl and Dr. William P. Bidelman, both instructors of astrophysics.

The New York Times reports that a Canadian military expedition by snowmobile, starting from Churchill on 14 February, will cover about 3,200 miles of Arctic country and finish in Edmonton on 5 May. The expedition will include 45 men of all ranks, together with a few United States experts, and will travel in 12 snowmobiles of a new pattern.

The route will be Baker Lake, where a meteorological station will be established; Cambridge Bay, over the top, and down past Norman Wells and Nelson. During the last part of the trip the snowmobiles will be called on to travel under different weather conditions, since it is expected that the ice breakup will have begun.

These vehicles, developed in Canada as an adaptation of the United States Army weasel, have wide tracks and have been proved capable of making a daily average speed of 35 miles in bad snow and ice conditions.

Defense Minister Douglas Abbott has stated that it is believed that the lessons learned will be of greater civilian than military value.

The Kerckhoff Marine Laboratory of the California Institute of Technology is again ready to receive applications for laboratory space from qualified investigators. No charge is made for research space. The Laboratory will be open throughout the year. Because of the housing problem, applications should be made well in advance. Address: G. E. MacGinitie, Corona Del Mar, California.

Preliminary discussions are being held looking toward the formulation of a definite building plan for the Fishery Biological Laboratory at Woods Hole, Mass. These discussions are continuing. Since a major reconstruction of the laboratory and its facilities is involved, it is necessary to give careful consideration to the long-term program which may be undertaken at Woods Hole, and to plan accordingly. When the Fish and Wildlife Service has reached a definite conclusion on these matters it will then be necessary to seek an appropriation from Congress in order to carry on the reconstruction.

A dictionary of American State names, some of which have origins quite different from those generally attributed to them, has been compiled by Dr. John P. Harrington, linguistic expert of the Bureau of American Ethnology, Smithsonian Institution. Originally published in the *Journal* of the Washington Academy of Sciences, many of the derivations after further investigation have now been revised.

An American Forestry Congress to formulate a postwar conservation program for the 630,000,000 acres of forest land of the United States will be held at Washington, in cooperation with national and state forest agencies and the forest industries, upon completion of the nationwide survey now being made by the American Forestry Association of the effects of war drains upon the forest resources of the country. The conference probably will be held in September, 1946. The survey, known as the Forest Resource Appraisal, has been in progress for the past twenty months. When completed, it will provide an analysis of the forest resources of the country after four years of total war.

A campaign to raise a five-year operating fund of $1,300,000 for the Southwestern Medical Foundation, Dallas, Texas, of which Dr. E. H. Cary is president, has been started. A fund of a million dollars is now held by the Foundation for the building of the medical plant of the Southwestern Medical College, which will be constructed adjacent to the new $7,000,000 City-County Hospital, as the nucleus of a Medical Center.

Returning veterans and displaced war workers who are scientifically and professionally qualified and who are seeking employment in industry, nonprofit research institutions, colleges, and universities are offered the help and the extensive resources of the National Roster of Scientific and Specialized Personnel. Many veterans plan to return to their for-

employers and need no help. Many industries can shift their technical staffs from war to peace production. On the other hand, a number of plants are not able to absorb the staffs formerly engaged in war production in their peacetime operations. All this adds up to a large amount of change and readjustment. Numerous statements have been made, apparently on good authority, that there are personnel shortages in most of the professions. It remains for an agency such as the National Roster, operating on a nation-wide basis, to assist all other efforts on the part of professional societies and individuals to find employment for all those who are rapidly becoming available.

Separation centers of the Armed Forces are cooperating with the National Roster to assist professionally qualified veterans to find employment in civil life. Return postcards and application and registration blanks are provided, and each center will be supplied at least every two weeks with a current list of positions that are open. The placement section of the National Roster will send brief statements regarding applicants to employers who have placed job orders with the Roster. In order to save time and increase chances of placement, these summaries are sent at the same time to several different employers having identical requirements.

Technical and professional personnel leaving war industries are invited to notify the National Roster that they are available for employment. If any are not already registered with the Roster, registration blanks will be sent to them promptly on request.

All employers who are not able to retain their full staffs and who wish to assist those of their professional employees who are leaving are asked to advise these individuals to ask aid of the Roster. Employers who are in need of additional personnel should send to the Roster descriptions of the positions which they wish to fill, together with detailed requirements as to age, extent of education, and amount and nature of experience.

Professional and technical societies that are engaged in organized efforts to place members of their professions are privileged to ask the cooperation of the National Roster.

The Roster is prepared to undertake placement in practically all professional fields except in elementary and high-school teaching, and does not restrict its help to the fields in which it maintains its registry.

The address is: National Roster of Scientific and Specialized Personnel, 1006 U Street, N.W., Washington 25, D. C.

Columbia University has filed plans with the Department of Housing and Buildings for an $800,000 auditorium and library at 646–54 West 168th Street at Fort Washington Avenue. The plans call for a ten-story structure, with an auditorium on the first floor and a library and reading rooms on other floors. The proposed library and auditorium would serve the College of Physicians and Surgeons at the Columbia-Presbyterian Medical Center. A campaign to obtain funds is planned.

The National Geographic Society, Washington, D. C., has announced plans for a series of flights between Washington and the equator to study cosmic rays. It is reported that the Army will cooperate with the society and that B-29's probably will be used. The flights will be made at different altitudes ranging from 5,000 to 35,000 feet, next spring.

A collection of 55 human embryos and fetuses, stained and cleared by the Scrultze technique, has been donated by Dr. Samuel Rabkin of Cincinnati to the Division of Physical Anthropology of the U. S. National Museum. When the specimens from this collection are viewed against a light they appear semitransparent, except for the skeletons, which are stained red and which vary in their completeness according to the developmental stages reached (6 weeks to 6 months). Accordingly, this collection lends itself both to exhibition and to study purposes and thus supplements the vast numbers of dried skeletons from late fetal and postnatal stages assembled in the Division by the late Dr. Aleš Hrdlička. In placing this material in a national institution it is Dr. Rabkin's desire that it be utilized by interested students. He prepared the material, which was collected on the white ward of a Cincinnati hospital, in connection with his studies on the development of the jaws. However, the material lends itself also to studies on other parts of the skeleton and to investigations in related fields.

Maj. Gen. Leslie R. Groves, director of the Manhattan District—code name for the Atomic Bomb Project—will address the joint meeting of the Institute of Radio Engineers and the American Institute of Electrical Engineers in the Engineering Society's Auditorium in New York, Wednesday evening, 23 January 1946. Gen. Groves will speak on "Some Electrical, Engineering, and General Aspects of the Atomic Bomb Project." Dr. Austin Bailey is in charge of the arrangements. Joint meetings between the IRE and the AIEE have been held since 1943 during the period in which the IRE holds its annual Winter Technical Meeting and the AIEE holds its Winter Convention. The Institute of Radio Engineers will be host at the joint meeting this year. At this joint meeting also, it was announced by Dr. Scott

Turner, chairman of the Hoover Medal Board of Awards, that the Hoover Medal, established in 1930 as an award by engineers to a fellow engineer "for distinguished public service," will be presented by the AIEE, the recipient to be announced later. This will be the seventh Hoover Medal awarded since 1930.

Rinehart and Company, Inc., is the new name of the book-publishing firm formerly known as Farrar and Rinehart, Inc. The address remains the same, 232 Madison Avenue, New York City.

Forty-five research chemists of Princeton University who worked on the atomic bomb project were awarded lapel pins in a ceremony on 26 December 1945. The group has been working under the direction of Hugh S. Taylor, chairman of the Department of Chemistry, and Prof. N. Howell Furman, analytical chemist.

The American Chemical Society will award fellowships aggregating $210,000 in 1946 and 1947 to aid in the training of chemists and chemical engineers, it has been announced by Bradley Dewey, president of the Society. Predoctoral students whose work was interrupted by the war will receive $100,000. Grants of $110,000 will be made to holders of the doctor's degree who desire to devote one or two years to research and teaching. Funds for the program have been allotted from a $500,000 educational fund established by the Society last April "for the advancement of chemistry" through assistance to promising young men and women, "the better to enable them as leaders to add distinction to the chemical profession and to ensure our country's welfare."

The predoctoral fellowships will carry an annual stipend of $1,200 for single candidates and $1,800 for married candidates, plus a maximum of $500 a year for tuition and laboratory charges. In the selection of recipients, great weight will be given to each applicant's sacrifices and contributions to the war effort, with special consideration for those who had begun their graduate work before they entered war service. "The granting of these predoctoral fellowships in chemistry and chemical engineering by the American Chemical Society is an immediate postwar measure," it was explained. "While successful candidates may reasonably expect continuation of support until their postgraduate work is completed (for a maximum period of three years), continued aid will be contingent upon satisfactory progress by the fellow."

These fellowships will be granted on the same scale as those of the National Research Council, and the committee reviewing applications for Council fellowships has been designated as the American Chemical Society Predoctoral Fellowship Committee. Members of the committee are: Prof. T. R. Hogness, of the University of Chicago, chairman; Prof. J. C. Bailar, Jr., of the University of Illinois; Prof. O. A. Hougan, of the University of Wisconsin; Prof. L. I. Smith, of the University of Minnesota; and Prof. H. H. Willard, of the University of Michigan.

Application blanks may be obtained from Prof. Hogness or from the American Chemical Society, 1155-16th Street, N. W., Washington 6, D. C. All applications should be sent to Prof. Hogness at the University of Chicago before 1 April 1946.

Postdoctoral fellowships will carry a stipend of $2,500 a year, with the understanding that the institutions at which the recipients study will provide an additional sum, presumably at least $1,000 a year, for teaching. Awards will be for one year, and will be renewable for a second year upon proof of satisfactory performance. Chemists and chemical engineers who received the doctor's degree since 1 January 1940 and have been engaged in war work, or persons who will have obtained the doctorate during the twelve-month period prior to 1 November of the year in which the award is made, are eligible for postdoctoral fellowships. All standard branches of chemistry and chemical engineering, including biochemistry, are covered by the grants, some preference being given to candidates interested in pure research. The Society plans to award ten of these fellowships before 1 June 1946 and ten more between that date and 1 March 1947.

Dr. W. Albert Noyes, Jr., head of the Chemistry Department at the University of Rochester and president-elect of the Society, heads the committee which will administer the postdoctoral fellowships. Others on the committee are Dr. Edwin R. Gilliland, of Massachusetts Institute of Technology, and Dr. Ralph L. Shriner, of Indiana University.

Applications for the postdoctoral fellowships, which should be sent to Dr. Noyes at the University of Rochester, must be submitted prior to 1 April 1946 by those who intend to begin work before 1 January 1947, and prior to 1 February 1947 by those who intend to begin work by 1 November 1947. Application blanks may be obtained from Dr. Noyes or from the Society's headquarters in Washington.

The Sun Oil Company and the *Houdry Process Corporation* announced plans for construction of two plants to produce carbon 13 in comparatively substantial quantities. In biological research, carbon 13 is used as a tracer. Indistinguishable chemically from ordinary carbon the isotope, carbon 13 is absorbed in living tissue and undergoes the same metabolic process as does ordinary carbon. But where ordinary carbon cannot be traced as it passes through the intricate metabolic reactions carbon 13 can be detected by the

use of the mass-spectrometer, and identified with specific bodily functions.

The Houdry Process Corporation has had in operation a thermal diffusion plant for the concentration of carbon 13, producing about one-fourth of a gram per month. This material has been made available without cost to members of the Isotope Research Committee for distribution to biochemical research institutions. Carbon 13, produced by the two new plants which Sun Oil Company will build, "will be made available without cost to qualified, non-commercial biological and medical research organizations whose activities and experience justify such donations." The carbon isotope now produced by the Houdry plant costs in the neighborhood of $400 a gram.

One of the new plants will duplicate the existing thermal diffusion plant and will be built for Sun Oil Company at the Houdry laboratories.

The other new plant will be constructed at Sun Oil Company's Marcus Hook Refinery and will be considerably larger in size. The complete plant will represent an investment of approximately $100,000 and, when operated at maximum capacity, will produce heavy carbon at the rate of about 500 grams per month. It is hoped that with this larger plant the cost of carbon 13 can be brought down to the order of $40 per gram. The construction of both thermal diffusion plants is based on a design by Dr. Alfred O. Nier, of the Department of Physics, University of Minnesota.

The Iowa State College Statistical Laboratory, under the direction of George W. Snedecor, will complete a study of a nationwide sample of population early this year. An additional grant of $35,000 to the Industrial Science Research Institute has been made for the work. The population sample, which will make possible the taking of a census more often than every 10 years, is an outgrowth of work by the laboratory on the Master Sample of Agriculture. The agricultural sample was completed in November 1944 and was used in the agricultural census this year. When data are tabulated, the sample figures will be checked against the complete enumeration. This sample covered 67,000 areas and approximately 300,000 farms. The planned population sample will include large cities and towns and will cover 200,000 areas and approximately 1,200,000 households. The work on the new sample has been done cooperatively with the Bureau of Agricultural Economics of the U. S. Department of Agriculture and the Bureau of the Census of the U. S. Department of Commerce. When completed it will mean a great saving in labor and expense in gathering census data.

The American Association of Scientific Workers, through its Committee for International Relations, Bart J. Bok, of Harvard, Chairman, released a nine-point plan to the press dated 30 December 1945. The plan outlines specific techniques designed to make the United Nations Educational, Scientific and Cultural Organization (UNESCO) in large measure responsible for the future welfare of science. The Committee asks that scientists everywhere discuss these proposals and suggest deletions, modifications, and improvements in them. The proposals follow:

1. UNESCO should promote the exchange of scientists, young and old, on a world-wide basis.

2. UNESCO should be charged with the responsibility of facilitating in every way the prompt interchange of scientific information.

3. UNESCO should take the leadership in the reorganization of scientific abstracting since many of the pre-war media were traditionally in German hands.

4. UNESCO should be an active agency to promote congresses of scientists of all nations. It should facilitate the prompt revival of the pre-war international scientific unions and assist in the formation of new unions.

5. UNESCO should aid making money available for the rehabilitation of scientific institutions in areas devastated by the war.

6. UNESCO should give aid and advice to the growing scientific institutions in countries like China, India and some of the Latin American Republics, particularly in providing much needed guidance in agricultural and technical matters.

7. UNESCO should undertake comprehensive surveys of the scientific and technological potentialities and resources of underdeveloped regions and should issue full public reports of the results of these surveys.

8. UNESCO should coordinate its activities with those of other international organizations with scientific and technological functions. There should be a close liaison between the science division of UNESCO and international organizations which are concerned with public health, communications, food, agriculture and fisheries, mineral resources, standards and power.

9. UNESCO should become the principal scientific advisory body in the United Nations Organization.

Meetings

A Conference on Industrial and Chemical Infrared Spectroscopy will be held at Mendenhall Laboratory of Physics, Ohio State University, Columbus, Ohio, on 13, 14, and 15 June 1946. This meeting will be sponsored jointly by the Physics Departments of the University of Michigan and the Ohio State University. The Conference will be a part of a larger symposium on Molecular Spectroscopy and Molecular Structure, to be held at the Ohio State University beginning

Monday, 10 June, and extending to 15 June. More complete details on this symposium will be published in a later issue of *Science*. Inquiries concerning the Infrared Conference may be directed to Dr. Harald H. Nielsen, Mendenhall Laboratory, or to Dr. Norman Wright, Dow Chemical Company, Midland, Michigan.

The New Orleans Academy of Science, under the leadership of Dr. L. J. Pessin, president, is celebrating its ninety-third year of service. All meetings are held at the Howard-Tilton Library, Tulane University. The program for the balance of the year includes: "Postwar Problems in Tropical Medicine," by Dr. Ernest C. Faust, Tulane University, on 21 February; "Hurricanes," by Mr. W. R. Stevens, U. S. Weather Bureau, on 21 March; and the Annual Meeting, the dates and program of which are to be announced.

Conditions Abroad

The Kaiser Wilhelm Institutes in Dahlem are intact and are being used by the American Army, according to information received by Prof. Richard B. Goldschmidt, of the University of California, Berkeley. The contents and staff of some (not specified) are said to have been removed to Russia. Although no details are available, it is reported that Timofeeff's Institute in Buch is one of these. In Würzburg, Burgeff's Botanical Institute and Just's Genetical Institute have been completely destroyed, Schleip's Zoological Institute (Boveri's old institute) has been mostly destroyed, and Elze's Anatomical Institute, partly destroyed. Fischer's Chemical Institute is intact.

Dr. W. Adam, of the Musée Royal d'Histoire Naturelle de Belgique, Brussels, has written to Dr. S. Stillman Berry, Redlands, California, that he has now returned to Brussels after a short evacuation period in France. While in Paris, Dr. Adam worked for about four weeks in the laboratory of R. Dollfus in the "Museum," where he made a revision of the Sepiidae of de Rochebrune. He adds that after the first year of occupation his work on Cephalopoda had to be abandoned and that recently he has worked exclusively on the Belgian Mollusk fauna. Gradually, Belgian scholars are resuming their research and writing activities and are now receiving American and English books. In conclusion, Dr. Adam reports the death in May 1945 of Paul Pelseneer, Belgian zoologist and teacher of chemistry.

Nature reports that after evacuation for a period of three years to Saratov, the Leningrad Society of Naturalists has resumed its activities at the State University of Leningrad. Several meetings, general and sectional (zoology, botany, physiology, and geology), were held last spring, and publication of the *Travaux* has also been started.

Recent Deaths

Dr. Hans Fried, 52, died suddenly at his home in Lansdowne, Pennsylvania, on 23 December 1945. Dr. Fried arrived in the United States from Austria in 1940. From September 1941 until November 1943 he was assistant in the Sproul Observatory, taking part in the measuring, reducing and discussion of photographic plates, and since July 1944 he had been lecturer in mathematics at Swarthmore College.

Dr. Edward Frankland Armstrong, 67, chemical consultant, adviser to the Ministry of Home Security and a member of the Civil Defense Research Committee, died in London 15 December 1945.

Dr. Arthur M. Banta, 68, professor emeritus of biology at Brown University, died on 2 January 1946.

George F. Eckhard, 67, dean of the University of Vermont's College of Engineering since 1932 and a member of the engineering faculty since 1915, died on 28 December 1945.

Benjamin H. Walden, 66, assistant entomologist at the Connecticut Agricultural Experiment Station, died on 6 January 1946.

Dr. Thomas Barbour, 71, a member of the faculty of Peabody Museum, Harvard University, and custodian of the Harvard Biological Station at Soledad, Cuba, died 8 January 1946.

Maj. Allan Brooks, 76, illustrator of bird books, died on 3 January 1946 at Courtenay, B. C.

Dr. Max H. Poser, 75, technical representative of the Bausch & Lomb Optical Company, died in Rochester, New York, on 4 January 1946.

Harry Taub, 46, professor of pharmacology at Columbia University and president of the New York Association of Clinical and X-ray Laboratories, Inc., died on 19 December 1945.

Dr. Louis Cleveland Jones, 75, industrial chemist, died on 29 December 1945 at Greenwich, Connecticut.

Ward Curtiss Priest, head of the Department of Physics and a member of the faculty of St. Lawrence University for thirty-four years, died on 20 December 1945.

Dr. Arthur Korn, 75, who was said to have been the first to transmit a photograph over wires, and is credited with founding the present system of phototelegraphy, facsimile, and radiophoto, died on 21 December 1945 at Jersey City.

Dr. Hale Houston, 74, professor emeritus of engineering at Washington and Lee University, died in Lexington, Kentucky, on 27 December 1945.

Letters to the Editor

Reply to Professor Reed

Many of us at the Naval Ordnance Laboratory have read with much interest the letter from Professor H. S. Reed to Senator Downey (*Science*, 1945, 102, 524) which was unanimously approved by certain of our colleagues of the American Association for the Advancement of Science. The letter seems to portray a lack of understanding of the problems confronting some of us in the employ of the Government and, I am sorry to say, is not likely to be very helpful in our attempts at their solution.

Those of us who have had considerable experience in research in Government are well aware of the difficulties encountered, yet we have seen programs carried out effectively and economically in spite of them. We are making strenuous efforts to obviate these difficulties and to raise the prestige of governmental scientific establishments. It is unlikely that we will be successful unless we have the approval and support of other scientists in the country. Therefore, a letter such as Professor Reed's assumes to us a very considerable importance.

Unless the United States assumes a more positive, constructive, and powerful position in world affairs from a political point of view, it is unlikely that we shall be successful in maintaining world peace. Whether our attempts to maintain peace are implemented by strong and wise political action or whether we take our chances with partial isolation as we have in the past, it is likely that a strong Navy will be necessary. There are a few hundred of us working in naval laboratories who have a very direct responsibility, in view of the present state of military technology, to keep the Navy strong. The naval laboratory programs make it necessary for us to carry on basic research in certain parts of certain fields simply because no other agency is interested in, or has the facilities for, doing this work. We, of course, carry on a very great amount of development also, again because neither academic nor industrial establishments are interested in doing, or are equipped to perform, this particular type of development.

We have observed with great interest the course of the Magnuson and Kilgore bills and the testimony which has been given in the hearings on them. We have a keen appreciation for the need of Federal support of research in this country and realize that this implies new sources of support for institutions which rely on the diminishing returns from endowments to maintain their high standards of productivity. The Bureau of Ordnance plans to spend about one-fourth of its research budget in such support by means of very general research projects assigned to universities. We are glad to see these things being done and give our wholehearted support to Congressional action in this direction.

However, *unless and until the great body of American science gives concrete evidence of its willingness to mix into naval affairs, to do the work which the Navy needs in the way of basic and applied research,* and *to prove that it will take continued interest in so supporting the Navy,* these naval laboratories must carry the responsibilities which they now bear.

We have instigated machinery for bringing about the changes necessary to make naval and all governmental laboratories more attractive places for scientists to work. We have fortunately received enthusiastic support for our efforts from a substantial number of very prominent and competent scientists, and we are inclined to doubt that Professor Reed's letter really expresses the sentiment in the rank and file of scientists in the United States toward the amount of consideration which we merit or the importance of the responsibilities which we carry.

R. D. Bennett, Captain, USNR
Naval Ordnance Laboratory
Washington, D. C.

Subaqueous Mud Cracks Formed by Settling

Mud cracks in strata have been accepted as a criterion that the sediments in which they were formed had been exposed to air. A recent observation on the part of the writers indicates, however, that this conclusion is not always a safe one.

In the process of making a ditch by means of dynamite, a pool of considerable extent was left filled with water for a period of about a month. The clay forming the bottom was originally smooth, but after three weeks developed a mud-crack pattern under water which could not be distinguished from sun-crack patterns formed subaerially. The dynamite blast served to loosen the soil to a considerable depth. In fact, the material at the very surface had been raised into the air by the explosion and had fallen back. However, in so far as direct observation could indicate, such material formed only a thin, negligible surface layer and probably had little, if anything, to do with the crack pattern which ultimately developed. The soil consisted mainly of fine clay material. That at the surface compacted, forming a relatively rigid bottom. Subsequently the deeper soil settled, the surface layer yielding to the movement by developing a typical polygonal mud-cracking pattern.

This observation suggests a need for caution in the interpretation of mud cracks in the geological record as evidence of exposure to air. Earthquakes produce a shock which tends to loosen soil. That settling following earthquakes may produce such patterns subaerially in soil has not escaped observation. Fossil mud cracks should be examined more closely in order to determine whether they are a true record of emergence or whether they may conceivably be a record of disturbances, particularly when they are found in sediments deposited at the time of some of our major orogenies. The Paleozoic mud cracks which have come to the attention of the senior author differ from those formed by settling, in that they are relatively shallow, rarely over

two inches in depth, relatively wide, and are terminated abruptly beneath by a bedding plane.

Such shallow structures represent drying of an unconsolidated top layer deposited upon a layer sufficiently older and more consolidated not to be affected similarly, and may safely be interpreted as sun cracks. The observed cracks, formed by subaqueous settling, could be traced downward to a depth of eight inches and probably extended farther. Extensive drying of unconsolidated materials, as under pleya conditions, may produce cracks of similar surface appearance and depth. No certain criterion seems available to determine whether such markings actually represent sun cracks, or whether they may represent settling cracks which may or may not have been formed subaqueously.

ROUSSEAU H. FLOWER and WILLARD G. IVES
New York State Museum

Soviet Biology

The article on Soviet Biology by Dr. Anton Zhebrak (*Science*, 1945, **102**, 357–358) is of great interest. He assures us that the official policy of the Soviet Government toward Genetics is tolerant and even helpful, and always has been. If this is so, it is strange that Russian geneticists were absent from the Sixth International Congress of Genetics held in Edinburgh before the outbreak of the war and from the recent London Conference on Genetics, at which Belgium, Denmark, France, Holland, Norway, Sweden, and the United States were represented. Russian geneticists had also been invited to both conferences at the same time as the others. It would do more to dispell the "misunderstanding" imputed by Zhebrak to geneticists of the Western World if we were told why Russian geneticists do not participate in international conferences. Above all, it would remove our anxiety if we were told what happened to Dr. N. I. Vavilov and to his work after 1939, since this work is regarded as being one of the most important contributions of Soviet Russia to the science of the world.

P. C. KOLLER
Royal Cancer Hospital, London

Study of Scientific Russian in American Universities

The importance of American scientists closely following the published Russian researches in their fields is gaining general recognition in this country. In this connection the American Association of Teachers of Slavonic and East European Languages, about a year ago, appointed a Committee on Teaching Scientific Russian.

A preliminary inquiry was conducted among universities where scientific Russian was known to be taught. It must be emphasized that practically everywhere in the 81 American institutions of higher learning where Russian was taught in the school year 1944–1945 (A. P. Coleman, *Amer. Slav. East Eur. Rev.*, 1945, **4**, 185–208) scientists or students of science were enrolled in Russian classes. Furthermore, a number of industrial organizations in this country now have classes in Russian organized for their technical employees. The figures given below, based on replies from 25 universities, must, therefore, be considered as smaller than the actual numbers. The principal objective of publishing this note consists in calling to the attention of American scientists, language teachers, and all interested individuals the need of introducing Russian wherever scientific and engineering training is given.

Of the institutions covered by this inquiry, 21 now accept or recommend Russian in partial fulfillment of the language requirements for graduate degrees in science. In other universities, acceptance, although not decided upon, is probable. About four hundred students were studying scientific Russian during the 1944–1945 school year. The figures for the current year are too incomplete for use. Chemists studied Russian in larger numbers than did other scientists; biologists, including physicians and medical students, came next and were followed by physicists, including radio engineers.

Organization of special courses in Russian for scientists apart from courses in general Russian, wider acceptance by American universities of Russian for graduate degrees in science, and procurement of Russian technical books and magazines are urged by this Committee.

J. G. TOLPIN
Universal Oil Products Company, Chicago

A Correction

Please correct a detail on page 17 of your issue of 5 January. You describe and quote from certain resolutions passed by the Metropolitan Section of the American Physical Society on 9 November; and in the course of your description, you unluckily speak of the position of the "Society" rather than that of the Section. Now the fact is that fewer than five per cent of the members of the Society were present at that meeting, of which no one had been notified in advance except the members living in and near New York and a few others. The resolutions cannot therefore be taken as an expression of the Society, even though many—myself included—think that a majority of the Society agree with them.

KARL K. DARROW, *Secretary*
The American Physical Society

Scanning Science—

Hon. A. D. White, formerly President of Cornell University, appeared on February 10th before the Senate Committee on a National University. He argued in favor of the plan, saying that in this respect the United States government is behind the European states. He contended that instead of weakening other universities, as had been claimed, the establishment of a National institution would strengthen all other seats of learning. It is expected that the committee will report favorably.

—21 February 1890

Book Reviews

Fungicides and their action. **James G. Horsfall. Waltham, Mass.: Chronica Botanica, 1945. Pp. 239. Illustrated. $5.00.**

This book, by a leading authority on fungicides, is the first in English exclusively on this important subject. It is especially welcome to plant pathologists for whom the principal treatises on fungicides have been in books devoted mainly to insecticides, with fungicides treated as a secondary, but related, subject. Horsfall has devoted most of the past fifteen years to intensive research on fungicides, and he and his associates at Geneva, New York, and at New Haven, Connecticut, have contributed many of the noteworthy advances in the knowledge of fungicides during that period. The present volume, as the writes states, "... is no cook book. It provides no recipe for cooking railroad ties in creosote, no spray schedule for combating apple scab or potato blight. It attempts to develop the underlying theory on which the practice is based, and by which the practice may be improved." In this he has signally succeeded. This book would constitute a fine textbook on the subject and an excellent handbook for professional plant pathologists, but would be of less value to extension men or growers.

Some of the important subdivisions of the subject matter are: history, general concepts (including definitions), laboratory assay, data assessment, principles of chemical protection, deposition, coverage, tenacity, artificial immunization and chemotherapy, action of specific fungicidal chemicals, antagonism and synergism, and phytotoxicity. There is a bibliography of 502 titles, a subject index, and an author index. The treatment is up to date. Some topics, such as chemotherapy and organic nitrogen fungicides, refer mostly to work in the past ten years, and much of the information on toxicity of organic compounds consists of previously unpublished data of the writer and associates. The various basic methods by which a parasitic organism may be rendered innocuous by chemicals are described and classified with examples. The treatment of bio-assay by means of straight-line dosage response curves is one of several unique features of the book. In addition to reviewing data previously presented in this way the writer has recalculated data in the literature in order to present it in this illuminating manner. There is an excellent treatment of toxicity and its relation to the molecular structure of organic compounds. The structural formulae of the more important members of several groups of fungicidally interesting compounds is given. Statistical methods and chemical analytical methods are largely omitted.

The documentation is quite thorough, but errors and omissions have crept in. On page 16 Horsfall refers to Neuberg's bio-assay of soil fertility, when he likely meant Newbauer, and no reference is given. On page 91 he refers to Wilson's data on coarse Bordeaux deposits, but the reference is to a paper which does not contain this information, and the correct reference is not included in the bibliography.

The manner of writing is more successfully designed for reader interest than is most scientific writing. Some will wonder, however, if "dunking" of spores is superior to dipping, and what the writer means by "smoked out the dithiocarbamates."

To treat the subject of fungicides in 188 pages of text necessitates the omission of much pertinent material, and it is to be expected that the balance chosen would be subject to criticism. Some of the more vulnerable aspects may be pointed out. Most of the specific data on foliage fungicides refers to tests on glass slides, and this is the only technique given in detail. The matter of tests on leaves is treated in fourteen lines and dismissed with the remark: "No evidence has been adduced yet that this procedure is more precise or reproducible or indicative than modern methods using the much simpler equipment for spore germination." Data in some of the papers listed in the bibliography as well as in others not listed indicate that this is not the case. And how do tests on slides require simpler equipment than tests on leaves? Not all will agree with the author's apparent attitude (previously published) that organic fungicides will soon replace the inorganics, and that "... . Bordeaux mixture and elemental sulfurs will be turned out on pasture to spend their last years in leisure as a reward for a good job well done." In the history of fungicides, credit for introducing copper carbonate for wheat bunt is given to Darnell-Smith (1917), and Von Tubeuf's recorded success with this remedy in 1902 is not mentioned. Nevertheless, this book may itself be a landmark in the history of fungicides.

C. E. YARWOOD

University of California, Berkeley

L'hérédité et l'homme. **Jacques Rousseau. Montreal: Les Editions de L'Arbre, 1945. Pp. 250.**

The author has prepared a brief résumé of the physical basis and methods of inheritance and catalogued into appropriate divisions many human hereditary characteristics. The genetic bases of most of these traits are discussed only briefly, and some of them are reported to have a simpler type of inheritance than facts justify. The author has a manner of expression which engages the reader's attention. Original sources of data are not usually given.

Except for an occasional gem of humor, nothing unusual is found in the chapters dealing with the elements of heredity. Diagrammatic figures used to explain genetic crosses are well done and helpful to a reader. A chapter on sex determination includes folk tales about sex control. It is unfortunate, however, that with his references to the use of a douche by Unterberger, by investigators using experimental animals to get a preponder-

ance of one sex, and in the ultimate production by that means of a male heir to Hirohito, the author did not refer to the less favorable results obtained by other workers.

In several chapters, the author names and briefly discusses many human hereditary anomalies and nonabnormal traits. These include body-build and anatomical characteristics and defects, blood diseases, metabolic defects, nervous and mental disorders, diatheses, and talent and character. Baldness is explained as a sex-influenced trait due to a one-gene difference, but the author's use of different symbols for males and females may be disturbing to the general reader. The inheritance of the blood groups and types and their use in determining parentage are explained rather completely. The author refers to and explains the three theories of inheritance of the AB groups—that is, as multiple alleles, two pairs of genes with independent assortment, and two pairs of linked genes.

In a concluding chapter on eugenics the author discusses the erroneous belief that eugenics and sterilization are synonymous, the blame being placed upon the mock modesty of the Anglo-Saxons. He cites the many methods which have been followed or suggested in the practice of negative and positive eugenics. The author specifies those methods which some persons cannot accept because of religious or other beliefs and mentions others, such as premarital examinations and studies of family histories with suggested celibacy or continence, which might be followed. The use of genetic analysis to help guide a person into proper marriage is a method of eugenics which should be emphasized more.

C. P. Oliver

University of Minnesota

Vertebrate paleontology. (2nd Ed.) Alfred Sherwood Romer. Chicago: Univ. Chicago Press, 1945. Pp. ix + 687. (Illustrated.) $7.50.

The publication of the second edition of *Vertebrate paleontology* will be universally welcomed by students of vertebrate evolution and especially by those of the English-speaking countries. The first edition of this excellent textbook filled a long-felt need and established for itself a solid reputation during the twelve years that have elapsed since its first appearance. It can be confidently expected that the new edition will continue the good record of this book.

The new edition is larger than the first edition, there being 687 pages in this book as compared with 491 pages in the earlier one. This increase is the result, in part, of new discoveries and new research in paleontology and, in part, of the inclusion of three new chapters on the history of the vertebrates—an innovation that will add appreciably to the value of the volume. These additions of subject matter naturally have resulted in a considerable amount of rearrangement in the text, so that in numerous places the new edition is quite different from the earlier book. Moreover, those portions of the earlier text that have been affected by new discoveries and new research have been accordingly rewritten and modified.

Needless to say, changes in details are numerous and only a few of the most outstanding points can be mentioned here. For instance, there is a new chapter on the placoderm fishes, and one each on the synaptosaurian and lepidosaurian reptiles. The Placodermi are made an inclusive group, containing the acanthodian fishes. The presentation of the teleosts has been expanded to emphasize their position as the dominant fishes of post-Cretaceous times. The Seymouriamorpha are considered as amphibians rather than as stem reptiles, following evidence brought forward in recent years by Russian authorities, while the mesosaurs are discussed along with the synapsid reptiles. Finally, the most mammal-like of the reptiles are treated as a separate order, the Ictidosauria.

Among the mammals, the Dermoptera are reduced to a suborder of the insectivores, while the miacids are placed in the fissipede carnivores, rather than in the creodonts as formerly. An interesting difference between the new edition and the old one is the placing of the primates immediately following the insectivores, the position of their natural relationships, rather than at the end of the book as the "culmination" of vertebrate evolution. In this regard it might be remarked that the tree shrews are considered as primitive primates rather than as insectivores—a reflection of the trend of opinion among modern mammalogists. The discussions of the Cenozoic mammals of South America have been amplified and revised in accord with the work done in recent years by certain North American students of these animals. Studies on the ungulates by various authorities in recent years have resulted in a revision of the treatment of these mammals in the text, while the lagomorphs are now made a separate order of mammals, as is generally recognized by modern mammalogists.

These changes and many more have been made with a thoroughness and a balance of judgment characteristic of Dr. Romer's very comprehensive knowledge of the vertebrates. Many new figures have been added to accompany the changes and expansion in the text. Of particular importance are the phylogenies, all of which have been revised and redrawn for the new edition. Even with the added new figures and the revised phylogenies, however, the bulk of the illustrations have been taken over from the earlier edition.

The classification at the end of the book is greatly expanded and changed (some of the changes have been indicated in the foregoing discussion) to include practically all genera of vertebrates occurring as fossils. This section of the book will prove to be extraordinarily useful to students working in fields of vertebrate studies.

The book is brought out in a new format conformable with other textbooks of the University of Chicago Series. This is particularly apparent in the new typeface and the cover. It is unfortunate, with an attractive and modern format, that wartime conditions resulted in the printing of this book on an inferior grade of paper. Because of this, the effectiveness of some of the figures is reduced, and the bad results of these economics are especially apparent in the index, which is rather difficult to read. Also, the price of the book is unfortunately high, and this may discourage some people, especially students,

who have a real need for it from buying it. But these are minor criticisms which can in no way be leveled at the author. All in all, this book is a masterpiece of thorough and comprehensive scholarship that every student of vertebrate evolution will want to own.

EDWIN H. COLBERT
American Museum of Natural History

Textbook of bacteriology. (14th ed., rev.) Edwin O. Jordan and William Burrows. Philadelphia: W. B. Saunders, 1945. Pp. xvii + 909. (Illustrated.) $7.00.

In preparing the fourteenth edition of this textbook the author continued the process of rewriting begun in the preceding edition and has achieved a considerable degree of transformation of the book into a text for medical students, both by the general emphasis on medical phases of the subject throughout and, more specifically, by introducing the discussion of the methods of bacteriological diagnosis, so conspicuously absent in the preceding editions. The omission from the previous edition of such important topics as antibiotics or iso-antibodies has been corrected, although in the presentation of the latter subject the significance of the important antigenic components of human erythrocytes other than the three major type-antigens is not discussed.

The organization of the material has been greatly improved in many instances through the adoption of a more logical sequence. Thus, for instance, the cholera vibrio is now discussed in connection with enteric organisms instead of having been placed with spirochetes. However, this process of organization was not followed in Chapter 26 or in the instance of venereal diseases, where gonorrhea is discussed on page 350, chancroid on page 473, syphilis on page 681, lymphogranuloma on page 823, and granuloma is mentioned only in the footnote on page 824.

Considering the limited space available, the new chapters covering the subject of medical mycology and medical parasitology, respectively, are excellent. Descriptions of organisms are clear and concise, yet they include most of the recent material in these fields.

The format of the book is commendable, the index is good, and the illustrations are unusually well reproduced.

J. J. BRONFENBRENNER
School of Medicine
Washington University, St. Louis

Russian-English scientific-technical dictionary. A. Bray. (Ed.) New York: International Universities Press, 1945. Pp. xvi + 551.

The publication of this dictionary fills an urgent need of readers and translators of Russian scientific and technical material. Despite increasing interest in Russian scientific literature in recent years, access to it has been impeded by the absence of a general Russian-English technical dictionary. The Russian-speaking reader of English material has been very fortunate in having a plentiful supply of dictionaries to meet his needs. The English-speaking reader, however, has had to guess the possible meaning of a word from the context and then check his guess against English-Russian technical dictionaries. Bray's new dictionary is a belated acknowledgment of the importance of scientific and technical work in the USSR, even though it ignores the critical fields of medicine and biology.

The present volume, containing 20,000–25,000 terms, is not as complete as the companion *English-Russian technical dictionary*, a 60,000–65,000-term volume released by the same publisher in 1941. This may be explained in part by the fact that the Russian technical vocabulary does not contain as many synonyms as does the English. However, some of the Russian terms which appear as equivalents of English terms in the older volume do not appear in the Russian-English work. The present volume does have a complete bibliography of sources and references, a matter which was omitted in the previous work.

The reviewer made a random selection of fifty Russian radio and engineering terms and of twenty-five Russian textile terms from a list of terms which had caused him difficulty in the past year. Almost all of the radio and engineering terms were found in this book. About half of the textile terms were found, although they were unusual and not particularly important. In general, the coverage of terms of the physical sciences and technology is sufficiently complete to meet all reasonable needs and sufficiently up to date to include "bazooka" and "radar."

RAYMOND A. BAUER, Ensign, USNR
Washington, D. C.

Coasts, waves and weather for navigators. John Q. Stewart. Boston: Ginn, 1945. Pp. vii + 348. (Illustrated.) $3.75.

Stewart's book is divided into three parts: "Coast lines, terrain and routes"; "Oceanography for navigators"; and "Meteorology for navigators." The first part should be of particular value to air and sea navigators and to the interested traveler. A general classification and description of coast lines is followed by chapters containing numerous quotations from the "Pilots" and the "Sailing directions" published by the Hydrographic Office. These chapters are profusely illustrated by aerial and ground photographs which clarify the features emphasized by the author. The reader ought to have a fairly good knowledge of general geography in order fully to enjoy the descriptions, because the examples are selected from all parts of the world and the author takes the reader from Peru to the coast of Maine and back to Patagonia without stopping for breath. The plan followed serves, however, to bring out the similarities in the character of coast lines within widely separated regions.

The part on oceanography represents a welcome addition to popular scientific literature, because few texts contain much information about the character of the ocean waters, the tides, and the ocean currents. The chapters on tides should be particularly helpful to the navigator who wants more information as to the contents of tide tables and the character of the tides. The section on ocean waves will need some modification when the results of studies conducted during the war become avail-

able. Photographs of heavy seas, of wave patterns, and of ice in the sea are particularly striking.

The part dealing with meteorology is well arranged in a manner which guides the reader from the simpler to the more complicated concepts. The progress made in the understanding of the physics of the atmosphere is brought out clearly, and the need for much more information is repeatedly stressed. Disturbed by the fact that the mysticism of the atomic physics appears to appeal strongly to people, the author pleads that "we can not afford to let the coming peace bring again such a retreat from the reality of earth, sea, air and the human mass."

A few details must be criticized. In the section on ocean waves, the statement that "breakers can occur in water much deeper than a wave-length, although a depth of about half a wave-length is more usual," is in error, because the depth of breaking depends principally upon the height of the breaker and not upon the wave length. Also, the author contradicts himself implicitly on the following page.

The chart of the ocean currents of the world gives the erroneous impression that the entire current which flows through Drake Passage continues along the coast of southwest Africa, whereas actually by far the greater mass of water is part of the Antarctic Circumpolar Current. There are also other details in this chart which are in error. An equally simple presentation could have shown the features correctly.

In spite of these and some other objections, the book is recommended for a large public because of the good arrangement of the material and the excellence of the illustrations.

H. U. SVERDRUP

Scripps Institution of Oceanography

Psychology for the armed services. **Edwin G. Boring (Ed.). (Prepared by a Committee of the National Research Council.) Washington, D. C.: The Infantry Journal, 1945. Pp. xvii + 533. (Illustrated.) $3.00.**

Psychology is a point of view which this timely text brings to bear on the manifold problems of war. Here the psychologist regards himself as a human engineer and presents his discussions of human capacities and limitations as other engineers might do for their materials. In past ages every captain of a military group of necessity has had to think about his men, their training, discipline, fighting strength, reactions to each other and to the enemy, and of home conditions left behind. World War I brought many psychological factors to the attention of military leaders, and the general public became conscious of these matters. This arousal was to be expected from the general advance of the science of human behavior. In part, also, it was due to the promptness with which American psychologists, following the declaration of war by the United States on 6 April 1917, organized themselves to promote the useful applications of their science within our Armed Forces. The dozen or more active committees then formed under the jurisdiction of the National Research Council made notable contributions, but work in these fields was largely stopped in November of 1918.

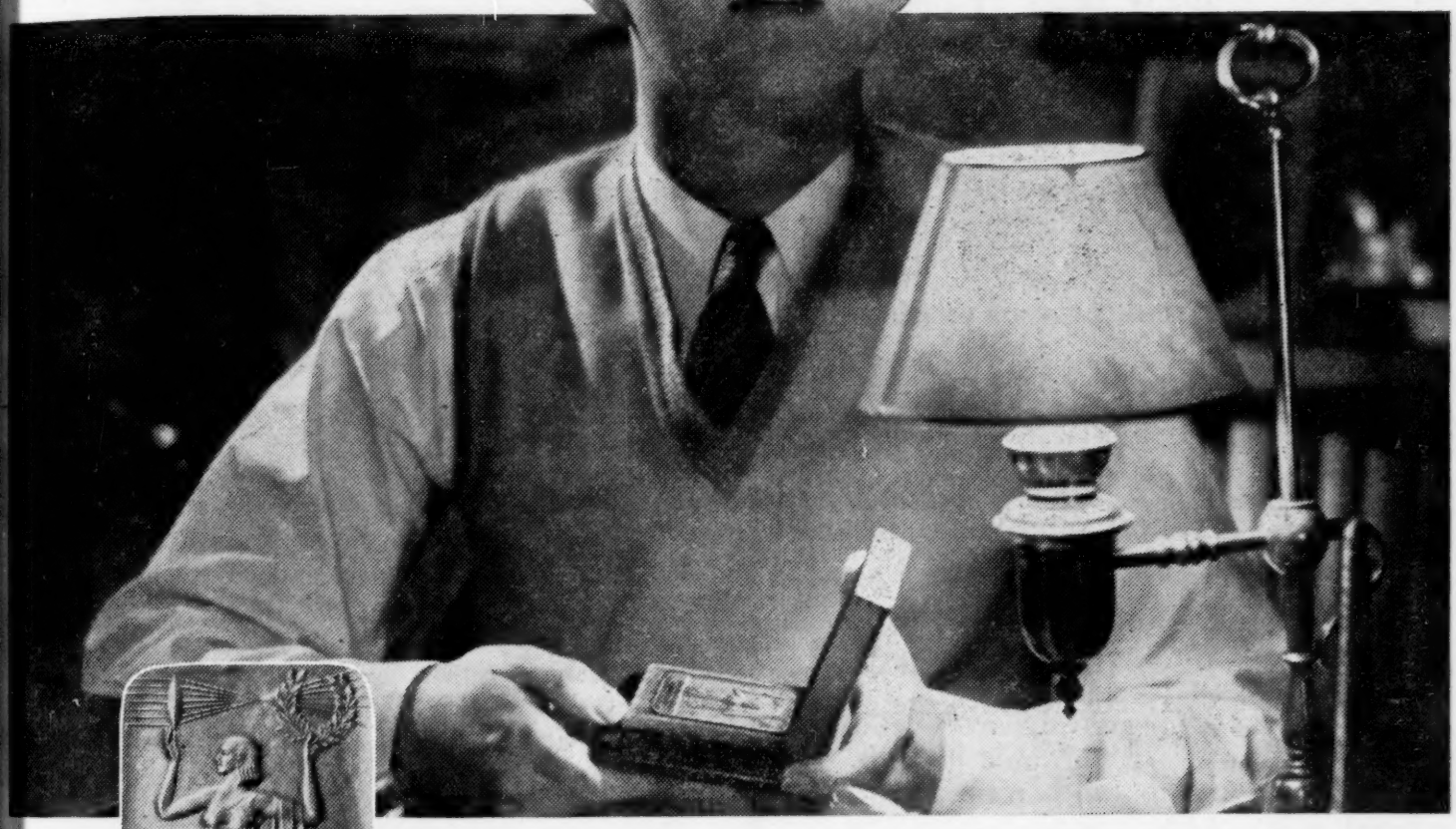
The second World War witnessed an enormous expansion in military psychology. In Germany the developments constituted a part of the Nazi scheme of preparation. The Nazi Government established a psychological general staff group that functioned under their high command through the Ministry of Propaganda and the secret police. There were set up divisions for research, tests, defensive morale, and offensive morale. In the United States the reorganization of psychologists for military purposes took place as an emergency measure with slow beginnings late in 1939. The Navy and the Army reacted promptly to the needs as they became revealed. They welcomed the assistance and consultation of psychologists, and presently were inducting them in wholesale lots and even making arrangements to train more of them. Finally, there was a total of approximately two thousand psychologists devoting full-time work to the war, in addition to those not in uniform who were aiding in research and other allied activities.

The unique psychology text under review is not a history of the participation of American psychologists in the war just ended. This book appeared too early to record the technical achievements and advances recently accomplished in the realm of military psychology. Most of these developments are still not released for publication. The significant and basic contribution made by this volume is its ordered and integrated presentation of the principles and main facts of psychology as they have bearing on, and application to, the problems of the military man, soldier or sailor, general or admiral. Dr. Boring, with consummate skill and with a background of learning and experience that has eminently fitted him for his task, has edited[1] a book which, in nontechnical language and great clarity of style, presents known facts about human traits and capacities and describes the special techniques that have been used in the past for assessing human capacities and controlling human behavior. Through a multiplicity of well-chosen examples he has spared no pains to show how these psychological concepts and techniques are directly applicable to the situations imposed on the individual by the military life and régime. He reveals how and where new techniques peculiarly applicable to the military situation develop or tend to develop.

The main body of the text begins with a consideration of man's sensory and perceptual equipment viewed as military resources. The general facts of vision and visual perception are presented clearly and authoritatively; then promptly the discussion heads toward concrete military problems having to do with vision, as, for example, in height-finding, the stereoscopic examination of reconnaissance aerial photographs, and the adaptation of the eye for night vision observation. There is an excellent chapter on color and camouflage, about which Dr. Boring writes with great competence, since he served

1 This volume was prepared by a committee of the National Research Council composed of the following individuals: G. W. Allport, W. V. Bingham, I. L. Child, Col. J. I. Greene, E. R. Guthrie, H. S. Langfeld, Col. E. L. Munson, Jr., Marjorie Van de Water, and E. G. Boring, *chairman*. Various collaborators prepared some of the materials for thirteen of the twenty-four chapters. Eleven chapters were written by Dr. Boring.

For Tomorrow's Men of Science



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THE MICROSCOPE

By Simon Henry Gage

Late Professor of Histology and Embryology, Cornell University

This outstanding reference which has been used for many years by both beginning student and experienced worker is regularly revised to include the latest developments in the science of microscopy. Now in its seventeenth edition (1941) it contains new information on such important subjects as the electron microscope, polaroid, plastics as mounting media, and high-pressure mercury lamps.

The student wishing to gain a thorough foundation in microscopy will find in this book simple, easy-to-follow explanations of the principles of the microscope and directions for the use of the instrument, further clarified by numerous illustrations. For the more advanced worker, the newer and more fundamental methods in microscopy are described, to keep him abreast of advances in microscopical science and techniques.

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during the war as a consultant in this field. The discussion is supplemented by a dozen or more well-chosen photographs, mostly of military origin. The physiological and psychological facts about the ear and hearing gleaned from long research in these fields are related to problems of deafness, malingering, telephonic communication, the effects of noise, and sound camouflage.

Two chapters on working efficiency deal with physical conditions, such as temperature, altitude, alcohol, tobacco and other drugs, and also with the influence of work habits, sleep and boredom in relation to fatigue and accidents. The seven rules given for determining the best method of work in any operation deserve wide consideration in the postwar period as well as in the emergency of total war.

Three chapters are devoted to selection of men, learning and Army teaching, respectively. These deal with general ability, special abilities, jobs, individual differences, and the technique of classification and assignment; the nature of learning, reinforcement and inhibition, study, rapid reading, memorizing, and recognition.

About one hundred pages are devoted to the treatment of motivation and morale, personal adjustments, emotions, sex, and leadership. The primary and secondary needs of the individual are clearly and adequately described. His methods of meeting these needs are discussed and compared. Particular attention is given to frustration, its frequent occurrence under military life, and the ways in which it may be dealt with. The chapter on emotions centers on fear, fighting fear and anger, and the psychological bases for their use and control. The review of sex needs and problems is more frank, objective, and devoid of platitudes than has heretofore been the case in elementary psychology texts in the English language. The psychological principles underlying the acceptance of leadership and the efficacy of leadership have often been written about, but in a single chapter of twenty pages this subject has probably never been covered more comprehensively.

The last hundred pages of *Psychology for the armed services* deal with those aspects which arise out of social psychology, such as rumor and its control, panic and mobs, the assessment of public opinion, its technique and reliability, propaganda and the methods of psychological warfare, and the differences among the peoples of the world.

This text was preceded by two earlier volumes, both pocket-sized books prepared under the direction of the same committee of the National Research Council: *Psychology for the fighting man*, edited by E. G. Boring and Marjorie Van de Water, and *Psychology for the returning serviceman*, edited by Irvin L. Child and Marjorie Van de Water, both sold in large editions. *Psychology for the armed services* represents the consummation of the objectives set by the committee. It covers more thoroughly many of the subjects treated in the two earlier volumes. There is a very adequate index, and for each chapter, except the summary, an annotated bibliography is supplied. There are many concise summaries and sets of psychological rules. They are not paraded, even in the index

but must be sought out in the contexts where they occur. During the next few years when former GI's form a large segment of our college population, this book will find wide usefulness as a text for beginning courses in psychology and will be outstandingly productive of class discussions. But it will also find a place on the bookshelf, within arm's reach, of many a military man and his industrially-minded brother.

WALTER R. MILES

School of Medicine, Yale University

Scientific Book Register

ALBEAUX-FERNET. *Les hormones en therapeutique.* Paris: Legrand et Bertrand.

ARCIERI, JOHN P. *The circulation of the blood and Andrea Cesalpino of Arrezzo.* New York: S. F. Vanni, 1945. Pp. 196. (Illustrated.) $4.00.

BAILLIF, RALPH N., and KIMMEL, DONALD L. *Structure and function of the human body.* Philadelphia: Lippincott, 1945. Pp. 328. (Illustrated.)

BARCLAY, ALFRED E., *et al. The foetal circulation and cardiovascular system, and the changes that they undergo at birth.* Springfield, Ill.: Charles C Thomas, 1945. Pp. 727. (Illustrated.) $6.50.

BEALS, RALPH LEON. *The contemporary culture of the Cahita Indians.* Washington, D. C.: Government Printing Office, 1945. Pp. 256. (Illustrated.) $.05.

BENHAM, H. E. *Aerial navigation.* New York: Wiley, 1945. Pp. 351. (Illustrated.) $4.00.

BOURNE, ALECK W., and WILLIAMS, LESLIE H. *Recent advances in obstetrics and gynecology.* (6th ed.) Philadelphia: Blakiston, 1945. Pp. 357. (Illustrated.) $5.50.

BRISCOE, HERMAN T., *et al. A laboratory manual of general chemistry.* (2nd ed.) Boston: Houghton, 1945. Pp. 326. (Illustrated.) $2.00.

DE BROGLIE, LOUIS. *De La mécanique ondulatoire a la théorie du noyau.* Paris: Hermann.

DELAUNEY, ADRIEN. *La penicilline.* Paris: Presses Documentaries. Pp. 90.

FELSEN, JOSEPH. *Bacillary dysentery, colitis and enteritis.* Philadelphia: Saunders, 1945. Pp. 632. (Illustrated.) $6.00.

FREEMAN, HENRY. *Deutsch-englisches Fachworterbuch der Metallurgie.* Ann Arbor, Mich.: J. W. Edwards, 1945. Pp. 327. $6.25.

HAYES, RALPH W. *Trees and forests of Louisiana.* Baton Rouge, La.: State University, Bureau of Educational Materials, Statistics and Research, 1945. Pp. 96. (Illustrated.) $.15.

JEANS, SIR JAMES. *The astronomical horizon.* New York: Oxford, 1945. Pp. 23. (Illustrated.) $.75.

LANDIS, PAUL H. *Adolescence and youth: the process of maturing.* New York: McGraw-Hill, 1945. Pp. 483. (Illustrated.) $3.75.

LICHTE, HUGO, and NARATH, A. *Physik und Technik des Tonfilms.* (2nd ed.) Ann Arbor, Mich.: J. W. Edwards, 1945. Pp. 419. (Illustrated.) $12.50.

MACCOLL, LEROY A. *Fundamental theory of servomechanisms.* New York: Van Nostrand. Pp. 148. (Illustrated.) $2.25.

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SACHANEN, ALEXANDER NICHOLAS. *The chemical constituents of petroleum.* New York: Reinhold, 1945. Pp. 451. (Illustrated.) $8.50.

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VERDOORN, FRANS. (Ed.) *Plants and plant science in Latin America.* Waltham, Mass.: Chronica Botanica, 1945. Pp. 424. (Illustrated.) $6.00.

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Catalogue Corner

Please write directly to the company indicated for any publication you wish mentioning the bulletin number and *Science*. Publications are gratis unless otherwise noted.

Specialized nutritional research products. Investigators studying nutritional deficiencies will be interested in a small catalogue of research preparations which have been standardized by the General Biochemicals Company. In addition to the many items which the company has pioneered in the past, two new products are listed. One is a "Yeast Supplement Solution" for microbiological procedures and the other is a "Basal Medium Stock Solution." The latter was developed to supply scientists with a complete medium suitable for microbiological Riboflavin Assay, U. S. P. XII. The former product is suitable for individual manipulation according to the research being undertaken. *Special products for nutritional research, Catalogue SC–461.* General Biochemicals, Inc., Chagrin Falls, Ohio.

Penicillin ointment. The control of certain infections may be possible by local penicillin therapy; others may require combined topical and parenteral administration. Based on research and clinical studies, Schenley Laboratories have prepared a penicillin ointment for topical application. The use of topical therapy for such infections as *sycosis barbae, sycosis vulgaris,* chronic infectious dermatitis, and folliculitis is described in a small brochure recently released. *Penicillin ointment Schenley, Brochure PB130–1 SC461.* Schenley Laboratories, Inc., 350 Fifth Avenue, New York 1, N. Y.

Sound films for science teaching. The Encyclopaedia Britannica Films Company has just issued an interesting and helpful outline of the film content of several hundred films now in regular stock. In addition to a description of the film, information is given about the collaborators and suggested uses in the classroom. Instructors who are just starting to use films will find the glossary of "film words" and projection suggestions of considerable help. *Classroom films (sound), Booklet KW SC–461.* The Encyclopaedia Britannica Films, Inc., 20 North Wacker Drive, Chicago 6, Ill.

Fine mineral specimens. The current annual edition of fine mineral specimens which the Ward's Natural Science Establishment issues has just reached this office. It is a price list with descriptions of individual mineral specimens suitable for the collector of classroom or museum exhibits. The minerals listed range from Acmite to Zuynite. Interestingly enough is the note that Uraninite cannot be shipped by mail. *Fine mineral specimens, Catalog 456 SC–461.* Ward's Natural Science Establishment, Inc., Box 24, Beechwood Station, Rochester 9, N. Y.

Electrical measuring instruments. The Weston Electrical Instrument Corporation has sent in its new catalogue of instruments. Included are laboratory and portable standards, testing portables, switchboard instruments, panel instruments, relays and controls, tachometers, thermometers, aircraft instruments, etc. The descriptions are unusually complete with technical specifications, diagrams, illustrations, and prices. *Weston electrical instruments, Catalog 13–A SC–461.* Weston Electrical Instrument Corporation, Newark 5, N. J.

Flame photometry. The increasing importance of trace elements in modern research and production emphasizes the need of a faster, more accurate method of analyzing for the presence of sodium or potassium in other elements. In answer to this need the Perkin-Elmer Corporation is presenting a new instrument, the Flame Photometer, which enables these difficult analyses to be performed faster and more easily than is possible by any other method. It permits direct reading, quantitative determination of sodium and potassium individually, in the presence of each other and of all other common elements. With this new instrument the time required for a routine analysis for both elements is less than 2 minutes when an accuracy of plus or minus 3 per cent is satisfactory, and less than 20 minutes when 1-per cent accuracy is needed. Extreme sensitivity on a small sample can be obtained, since one microgram in 16 cc. of solution (0.1 p.p.m.) can be detected. *The Perkin-Elmer Flame Photometer, Model 18, Bulletin SC–462.* The Perkin-Elmer Corporation, Glenbrook, Conn.

Photographic materials for spectrum analysis. The Eastman Kodak Company has recently published a handbook on the photographic problems related to spectrographic analysis. Illustrated with charts, graphs, and reproductions of spectroscopic plates, the handbook gives useful information on a wide range of topics. Among the subjects covered are: the properties of plates and film; precautions in photographic photometry; choice of photographic material; processing; storage of photographic materials; handling of plates and films. Data sheets give the important facts about ultraviolet and infrared sensitive films and plates. *Kodak materials for spectrum analysis. Handbook SC–462.* Eastman Kodak Company, Rochester, N. Y.

Biological supplies. The 1945–1946 catalogue of the General Biological Supply House, Inc., has just reached this office. Its 416 pages list the thousands of biological items carried in stock by this house. Among the new listings to be found in this edition are bacteria and mold cultures, new key cards and quiz sheets, special anatomy charts, improved microscope and Kodachrome slides, and plastic embedded specimens for display and demonstration purposes. *Turtox biological supplies, Catalog No. 12 SC–462.* General Biological Supply House, Inc., 761 East 69th Place, Chicago 37, Ill.